

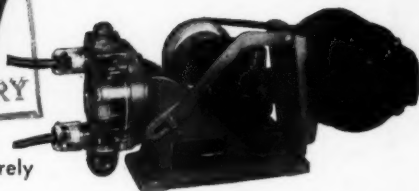
PUBLIC WORKS

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1948

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Bill and What It Means

Double Arch Bridge Built by
County Forces

Second Stage Filter Removal
Without Recirculation

Street Cleaning Methods and
Problems in Toronto

Lemon Grove Builds a
Reservoir

Thawing Frozen Pipes With
an Electric Welder

Pumping Station Solves
Storm Drainage Problem

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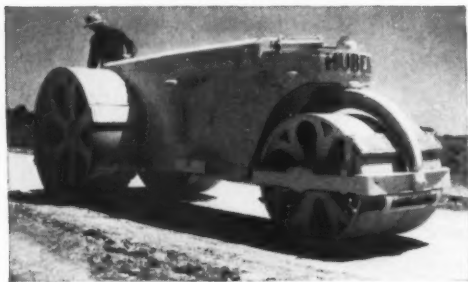
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THE HUBER 3-WHEEL ROLLER



THE HUBER 3-4 TON TANDEM ROLLER

Smart road men know the advantages of putting Huber road machinery on their toughest road jobs. After several operations you'll be surprised at Huber's speed... efficiency... and ability to really take it, to say nothing of Huber's proven economy of operation.

These Huber characteristics are the results of over 35 years experience in the road machinery field. During these years Huber has paid particular attention to the needs and demands of reliable road men—a practice which has enabled Huber to give you machinery more suited to all road operations.

Size up the scope of your road work and let your Huber distributor help you specify a Huber machine to do your job better. Huber rollers are available in either 3-wheel or tandem models in sizes from 3 to 14 tons—more than ample for any road assignment. For a real "ace in the hole" you can't beat the versatile Huber Maintainer. It's a bulldozer, lift-loader, patch roller, berm leveler, snow plow, or rotary broom all in one. It's a "must" for highway departments and other maintenance units. Write today for bulletins describing the Huber road machinery which most interests you.

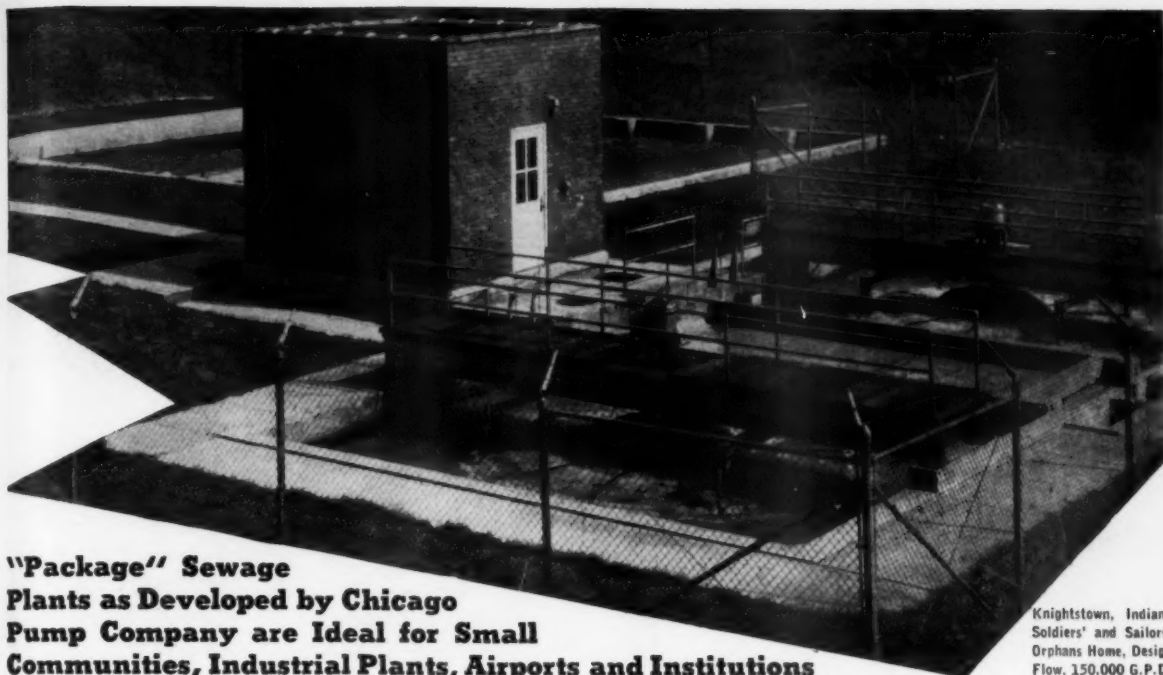
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ROAD ROLLERS
and
MAINTAINERS

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VOL.



"Package" Sewage Plants as Developed by Chicago Pump Company are Ideal for Small Communities, Industrial Plants, Airports and Institutions

Knights town, Indiana
Soldiers' and Sailors'
Orphans Home, Design
Flow, 150,000 G.P.D.

Because-

They require a minimum of operating supervision, produce a sparkling clear effluent, are free from flies, foul odors and unsightly appearance. Can be located near dwellings.

Initial cost of "Package" plants is low and they are inexpensive to operate.

Local Operators without previous sewage treatment experience successfully operate these plants. Former farmers, salesmen, coal-miners, truck-drivers are operating existing plants and performing other municipal duties.

Operator training service by Chicago Operating Sanitary Engineers is provided with each plant. Ingenious automatic features of Chicago "Package" plants simplify operation and assure successful performance.

Aeration and clarification are performed in a single tank with positive, automatic sludge control. One sludge setting covers a wide range of sewage flows and strengths.

Since 1934 over 100 plants have been installed and are successfully operating.

Properly designed, these units can handle industrial, cannery and other wastes as well as the usual community sewage.

The "Package" plant was specifically developed for small populations and can be engineered to meet requirements. Complete literature available.

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SEWAGE EQUIPMENT DIVISION

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For Diesel Engines . . .



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The Fairbanks-Morse Model 38 Opposed-Piston Engine!

The Model 38's advanced two-cycle Opposed-Piston design eliminates 40 percent of the working parts of the ordinary Diesel engine. The Model 38 has no valves, no cylinder heads—*produces up to twice as much horsepower per foot of floor space!* For heavy-duty service as the main engine in small plants or a space-saving unit in larger installations, consider the basic advantages of the Model 38. See your Fairbanks-Morse Diesel specialist for full particulars . . .

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PUBLIC WORKS

*The engineering authority in the
city-county field*

Founded in 1896

Edited by

W. A. HARDENBERGH and A. PRESCOTT FOLWELL

NOVEMBER, 1948

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THESE "Perfect Partners" CUT CONSTRUCTION COSTS



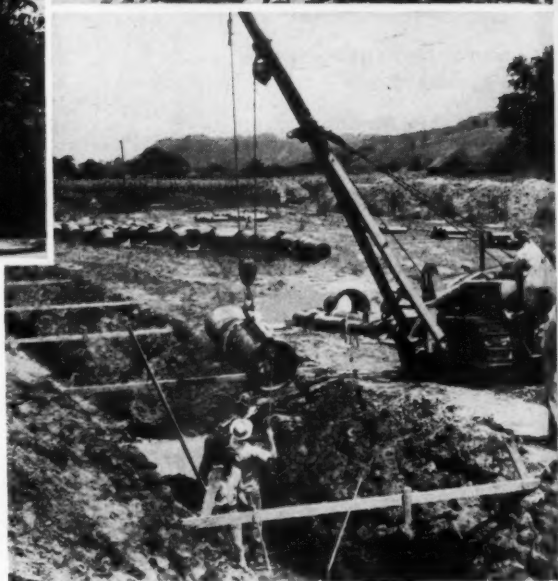
GREATER LOS ANGELES SAVES MONEY USING STANDARD AND EXTRA- STRENGTH CLAY PIPE IN SAME LINE

Dotted by homey cottages, this section of Downey, on the southeastern fringe of the greater Los Angeles area, is now completely sewered with more than five and a half miles of Vitrified Clay Pipe laid in one project. This area has been served previously by cesspools.

Chemically-inert Clay Pipe is the ideal pipe for installations where briny water and acid soil conditions are encountered. On the Downey job, water was encountered innumerable times at shallow depths.

Los Angeles area engineers know their construction—and their Clay Pipe—from long experience.

For example, they know *Standard Strength* and



Extra-Strength Clay Pipe can be used in the same line to carry the same flow. In the Downey sanitary sewers, the designers saved money using 5,850 feet of *Extra-Strength* Clay Pipe only where necessary to withstand the extra loads at various points along the line. 21,760 feet of *Standard Strength* Clay Pipe completed the line.

If you need specific information on a Clay Pipe problem, write the details to the office nearest you.

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Vitrified
CLAY



PIPE

The Editor's Page

The Need for Better Utilization of Engineers

We hear a great deal about the need for better and more complete utilization of engineers in national emergencies. The research organizations, the civil defense program, and others are interested and are forming committees and study groups to determine how many engineers there are and how they can best be utilized. Also, where they are needed.

One thing is certain—during the next ten years there will be fewer engineers available than we had in 1941. We lost four or five years of engineer production. It has been estimated that in numbers, the deficit will be made up within the next 3 or 4 years. But mere graduation from college does not make an engineer; it takes ten years of tempering after graduation. So by 1958 or thereabouts, we should be back where we were at the start of World War II. Maybe we will then be a little better off from a numerical viewpoint, but we must not forget that time is always taking its toll.

This means that in our present planning we must use these men who are available far more efficiently than we did in World War II. Take sanitary engineers, for instance; more than a thousand were used in the Sanitary Corps alone. Probably 600 could have done the job if used to the maximum of their abilities. If another emergency should arise, this must be done. It will require a new viewpoint by the Medical Department; a better organization than now exists; and a far greater centralization of control in the chief of sanitary engineering.

The Corps of Engineers, too, must revise its old-time policies—we refrain from calling them ideas—or it is going to be passed by to become little more than a pioneer corps. The nation can no longer afford to let it waste from 50% to 70% of the engineering skills entrusted to it. War may be wasteful, but it hadn't ought to be that bad.

There is a stirring in professional circles, and this is all to the good. Now is the time to thresh out these vital matters.

The Lighter Sides of Engineering

Engineers are notoriously serious-minded, and perhaps too much that way. However, once in a while they unbend. From Illinois comes a note that there have been recent "immersion rites" in SOWHESS, which is the Society of Operators Who Have Experienced Saturation in Sewage. We understand that perfumed certificates of membership are issued. Probably they are needed.

A widely known and highly respected organization in which hundreds of sanitary engineers hold membership is the Order of the Boar. During the war, meetings and initiation ceremonies were held all over the world. Even the two stars of a major general could not mitigate the ceremonies and solemn rites of induction, nor curb the proclivities of the mascot boar.

Perhaps our own acquaintance with the field is imperfect, but we know of few other such light-minded engineering organizations. The Order of the Moles, made up of men who have engaged in tunnel construction, is reputed to be able to put on a worthy celebration. We should be glad to hear of other organizations for and of engineers that are in the same category, though it must be clearly understood that this does not constitute an offer to compile a directory nor to offer ourselves for membership in any of them.

A Bit of Recognition to Leaders in Our Field

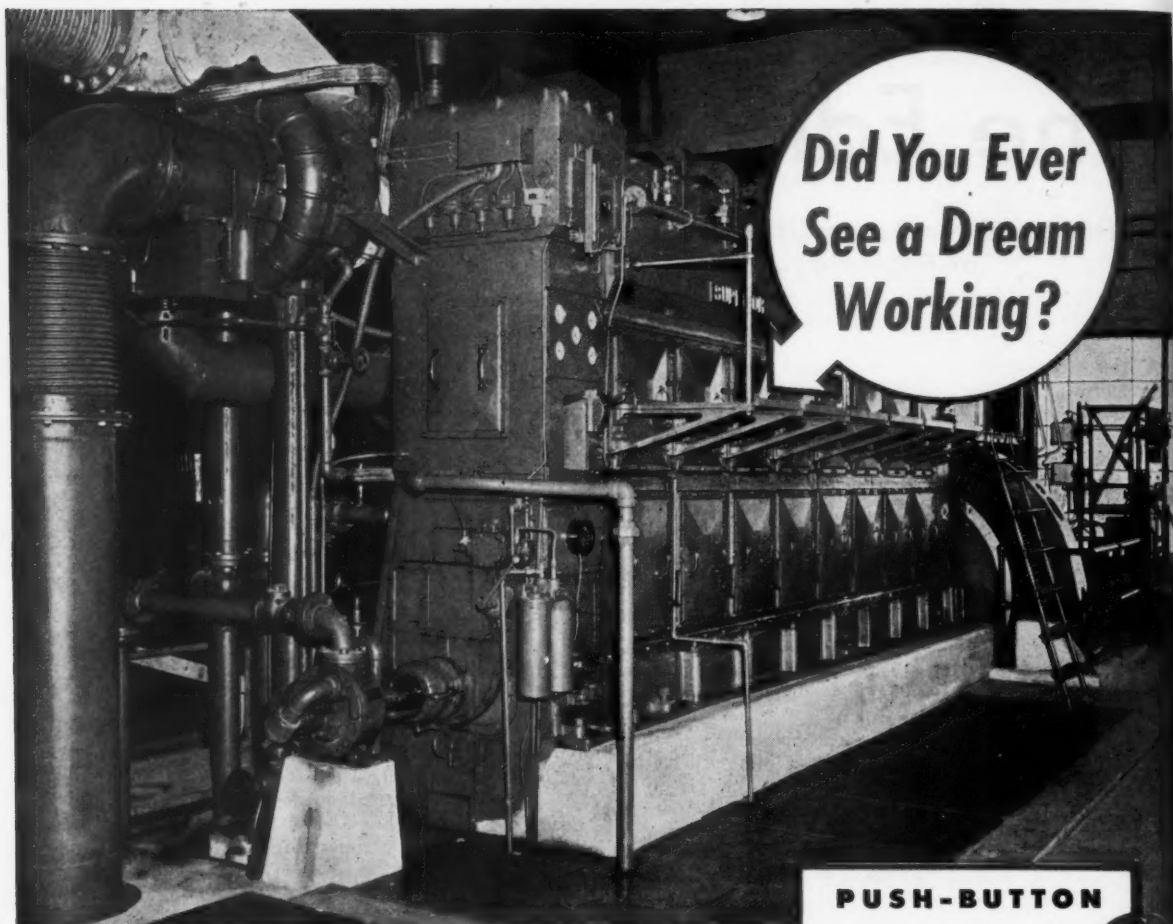
Beginning with this issue, we will publish every month pictures of leading men in the public works field. Many of these men will be engineers, though we will not restrict ourselves to engineers exclusively. Initially, we have not fixed a final location for these pictures, and pending a decision on this, they may appear in any of several places. The principal thing is not the location, but the fact that the men selected are but a few of the many who have contributed so greatly of their talents and skill to the advancement of engineers and engineering and to the broader utilization of engineering for better living.

Why Membership in Engineering Societies?

Engineers do not seem to be "joiners" by nature, inclination or even training. Yet there are many advantages to membership in technical societies. For instance, the many who attended the Sewage Works Federation and the Public Works meetings in October will agree almost unanimously that these provided not only a technical lift, but even greater opportunity for that personal contact with others in the field which is of so great value.

But there are other reasons why, more than ever before, engineers should join our national technical associations. There are problems of service to our country, of better utilization, of broader employment, of standards of training and education, and of better pay. These can best be solved by joint action; in fact, it is doubtful if they can be solved in any other way than through our organized engineering groups. In this respect the engineering profession is far behind other professions, as medicine and law. It needs to have national representation that can speak for it with authority and can see that in national matters it is not by-passed and forgotten.

There's a job to be done in educating such men as that Air Force general who is reputed to have said that there are only three professions—law, medicine and the clergy. The fact that by making such a statement he showed his own narrowness and ignorance is beside the point. There is still a job to be done, and it can't be done individually.



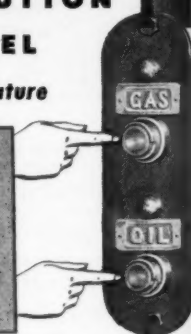
● A model 80 supercharged Superior Engine in an REA system, is performing beyond the dreams of most operators. This tough engine is operated week-after-week at full load. What's more, this Superior Diesel is producing a greater number of kilowatts per gallon of fuel oil than any other engine in the entire 12 county system.

This outstanding performance was due to skillful operating and the following features offered by all Superior Diesels: Conservative Ratings • Efficient Pressure Lubrication • Clean Combustion • Precision Bearings • Heavy Rigid Crankshafts • Strong Bases and Cylinder Blocks • Proved Roller Chain Camshaft Drives • Oil Cooled Pistons. We will be glad to send you a fully illustrated booklet that tells how these features can help you.

PUSH-BUTTON DUAL FUEL

A Superior Feature

JUST PRESS
A BUTTON
to burn your
choice of fuel



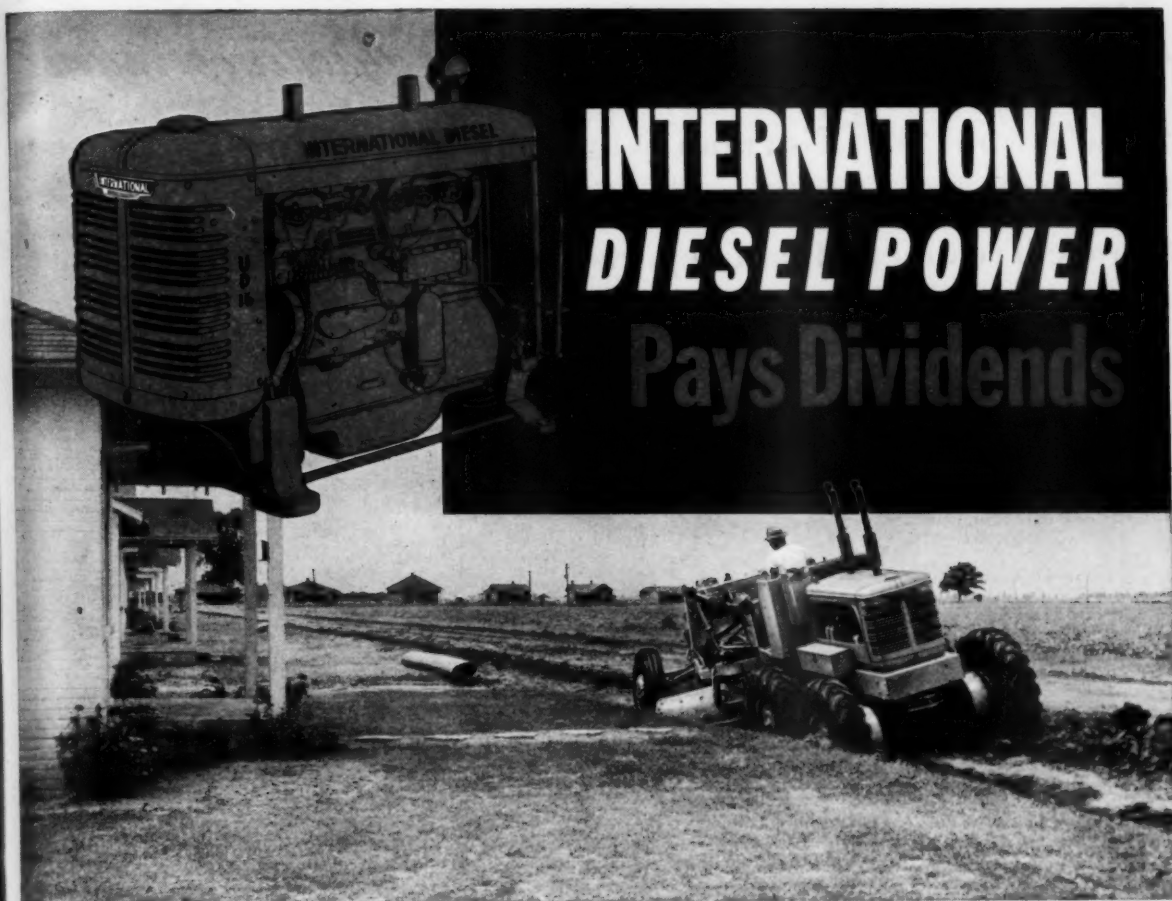
Superior is the first and only Diesel with push-button control of fuel selection that permits you to switch from oil to gas; or gas to oil instantly — with the flick of a finger.



Superior
DIESEL

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THE NATIONAL SUPPLY COMPANY
Plant and Warehouse, 1000 N. 1st St., Milwaukee, Wis.

**60th
Anniversary**



INTERNATIONAL DIESEL POWER Pays Dividends

IT'S wise to specify International Diesel power in motor graders, shovels, draglines, in fact every type of earthmoving equipment. They are your assurance of minimum "down time" and low maintenance costs.

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International Diesels are dependable—built to work hours upon end with a minimum of

fuel, lubrication and maintenance costs.

International Diesels deliver smooth, steady power with plenty in reserve for sudden overloads in tough going.

These are just a few reasons why it pays dividends to specify International Diesels. Your International Industrial Power Distributor will show you many more. See him about your power problems.

Industrial Power Division

INTERNATIONAL HARVESTER COMPANY
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on Power
that Pays

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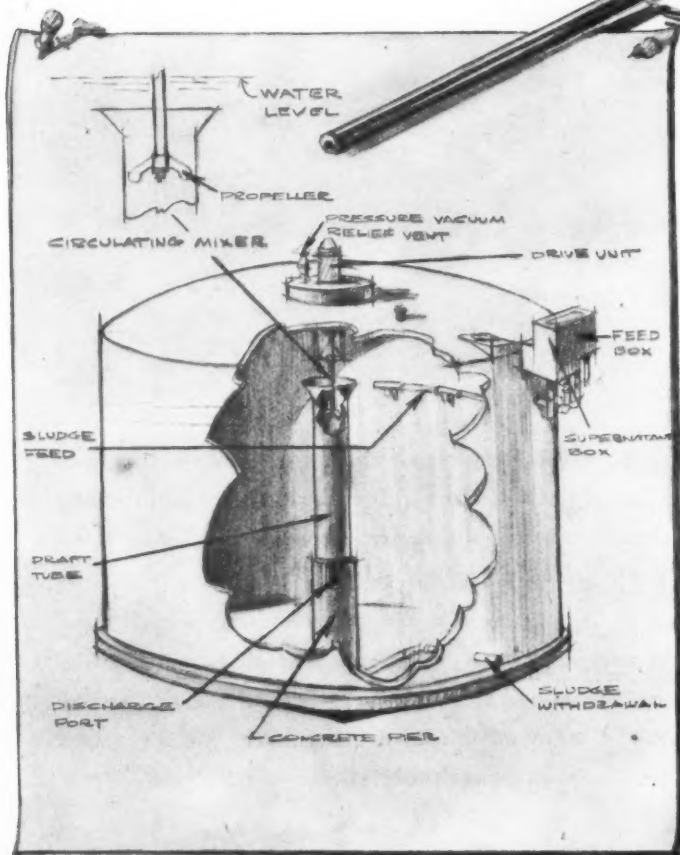
When writing, we will appreciate your mentioning PUBLIC WORKS

What does intensive mixing mean in Digester operation?

Here's what Mr. Norman Wagner,
Superintendent of the Stamford, Conn.
Sewage Treatment Plant reports . . .

TESTS WERE RECENTLY CONDUCTED at the Stamford, Conn., Sewage Treatment Plant to measure the effect of intensive mixing on scum formation in Dorr Digesters. A 50' dia. Primary Dorr Digester with a fixed steel dome was equipped with a draft tube and high-capacity circulating mixer arranged so that conditions within the tank could be observed. As typified by Mr. Wagner's comment, results were definite and conclusive:

"During testing of Dorr Digester equipped with a high-capacity circulating mixer, we allowed scum to build up for a period of one week. The result was a scum layer a foot thick . . . which disappeared after only 60 minutes of mixing."



✓ Scum formation was positively eliminated. All scum was submerged by mixing action.

✓ Action was rapid . . . 60 minutes to eliminate 1 foot scum layer . . . an hour and a half to turn over entire tank contents.

✓ Continuous operation of the mixer was not required.

✓ Intermittent operation of the mixer maintained a homogenous sludge mixture.

The draft tube and circulating mixer demonstrated at Stamford are now standard on Dorr Type M and MA Digesters. Several installations featuring this new development are now being made . . . one of which comprises 18 110' dia. units, each equipped with 3 mixers. A Dorr engineer will gladly furnish more detailed information on this new and proven development.

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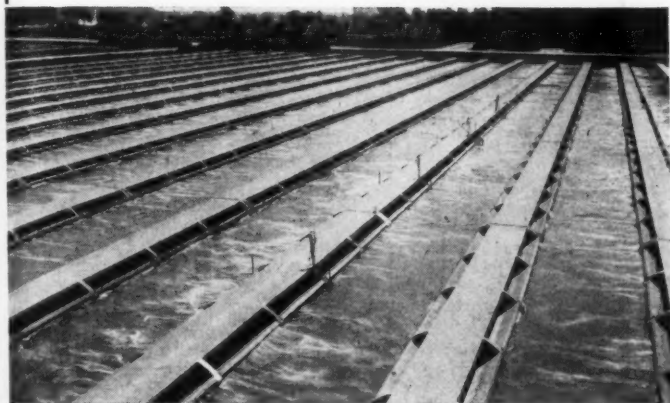
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RESEARCH ENGINEERING EQUIPMENT

When you need special information—consult the READERS' SERVICE DEPT. on pages 67-69

Performance in World's Largest Sewage Treatment Plant...

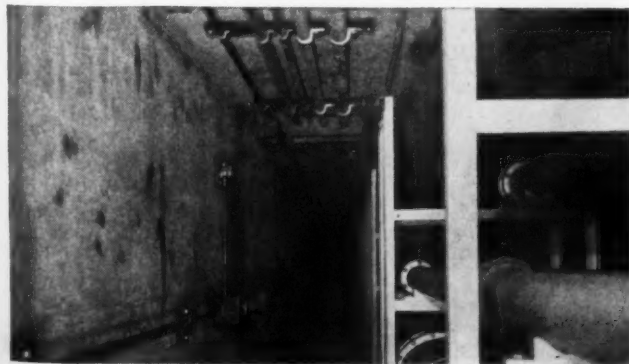
...leads to extended use
of Everdur Electrical Conduit



Everdur Electrical Conduit serves the aeration and final settling tanks in bringing power from the operating galleries to the sluice gates of the control centers, and from these centers to the operating mechanism on the center pier of each tank.



General view of Southwest Treatment Works, Chicago, world's largest activated sludge sewage treatment plant.



Everdur Electrical Conduit in service tunnel looking north from north gallery.

WHEN Chicago's Southwest Sewage Treatment Plant was built twelve years ago, it utilized 14 miles of Everdur® Electrical Conduit, in sizes from $\frac{3}{4}$ " to $2\frac{1}{2}$ ". Conduit of Everdur Metal was selected because of its high physical properties and excellent resistance to many corroding agents.

More and more Everdur Conduit has gone into this plant, as its 1939 capacity of 400 m.g.d. has been expanded to 1,000 m.g.d. at mid-1948. Further expansion will take place over the next 5 years. Considerable Everdur Conduit is specified in several new contracts awarded to the Northern States Electric Company, Chicago.

For detailed information on Everdur Copper-Silicon Alloys in Sewage and Water Works service, write for Publications E-11 and E-5.

AN188

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NO "HEDGING" ON BLOWER QUESTIONS FROM *R-C dual-ability*



Three R-C Rotary Positive Blowers, with capacities of 300, 500 and 700 CFM respectively, at Mansfield, Ohio, sewage plant.



R-C 2-stage Centrifugal Blower, capacity 13,500 CFM, in sewage treatment plant at Houston, Texas.

When you ask Roots-Connersville engineers about blowers or gas pumps for sewage plant or waterworks applications, you'll get unbiased answers, without "hedging" between Centrifugal or Rotary Positive equipment.

That's because of our *dual-ability* to design and build both types. We recommend whichever is best suited to the specific application. We are the only blower builders offering you this important *dual choice* . . . an advantage which usually saves time, money and trouble.

Our long experience in supplying sewage plant and waterworks equipment, including meters and vacuum pumps as well as blowers and gas pumps, results in reliable and economical performance of R-C units.

For straight answers that mean long-time satisfaction, consult R-C *dual-ability*.

ROOTS-CONNERSVILLE BLOWER CORPORATION

811 Poplar Avenue, Connersville, Indiana

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BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

* * ONE OF THE DRESSER INDUSTRIES * *



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Letters

WATER FOR AIR CONDITIONING

This letter refers to the letter of inquiry by Mr. Townsend in the September issue of PUBLIC WORKS.

Several years ago, when the "desert type" cooler first became popular in Las Vegas, we were faced with a similar problem, one which rapidly became alarming. At that time, a large number of home-made coolers appeared, consisting usually of excelsior in a wire frame with an electric fan back of it to blow the air through the excelsior, and an ordinary garden hose running water in the top of the excelsior to keep it damp. The immediate results were breeding spots for mosquitoes (something previously unknown here), houses plugged up with humidity, and excessive waste of water.

We were handicapped by an existing Nevada statute which prohibits the use of water meters in towns of over 4500 population. However, we made a house-to-house canvass and compiled a list showing the type of cooler used by each home, the size of water line supplying the cooler and estimate of total consumption. We also receive our supply from wells, and know there is a limit to the amount of water that can be withdrawn from the underground supply.

When the manufactured type coolers appeared on the market, some of them were equipped with recapture pumps, which picked up the water from the bottom of the cooler after it had percolated through the excelsior, and recirculated it. The use of the pump (which cost about \$15.00) resulted in trouble-free operation of the cooler, a 100% increase in cooling efficiency, and, most important from a community standpoint, a very noticeable conservation of water. Test showed a cooler equipped with recapture pump used only 8 gallons per day, or about the amount that was evaporated.

We made no additional charge for water used by coolers, but took two steps which were beneficial in saving water: 1. After thoroughly discussing the subject with the City Commissioners, they passed an ordinance prohibiting use of water in a cooler not equipped with a recapture device; or running water through cooling coils of a refrigerating machine, thence into the City sewer lines without recapturing and re-using such water; or allowing water to be wasted without putting it to beneficial use.

2. We sponsored an educational campaign to show the increased cooling efficiency resulting from use of a recapture pump, and while we were at first accused of being in "cahoots" with the pump manufacturers, when its value was demonstrated the pump was almost universally adopted.

And that, in my opinion, is the very

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essence of water conservation; if you can show the people that they actually benefit by saving water, they will co-operate without the need for any onerous laws or fines for water waste.

Yours for saving water,
A. M. FOLGER,
General Manager
Las Vegas Land & Water Co.,
Las Vegas, Nev.

OUR DIGEST
ARRANGEMENT

Congratulations on the change you have made in arranging the Digests. It is very good. What Mr. Faber says has been my complaint for years.

Clinton L. Bogert,
Consulting Engineer,
New York, N. Y.

CHARGES FOR
FIRE PROTECTION

I wish to thank you for the information in regard to charges for private fire protection. The list you sent is very helpful and we may wish to review the remainder of your questionnaire later. However, I doubt if the Court is going to be as much interested in what other cities do as in whether we can justify our own charge; so, for the present, I am concentrating on our costs and allocations of charges.

P. A. SHAW, Superintendent,
Manchester Water Works, N. H.

We are glad to help in every way possible.

SEWAGE PUMPING

Please send us your "Manual of Sewage Disposal Equipment and Sewer Construction." We are especially interested in material that will help us to design a sewage pumping station which will utilize the latest developments in that type of equipment.

If you find it necessary to send us issues of previous years in order to supply us with the information we seek we will gladly accept them.

Payment will be forwarded to you upon receipt of your invoice.

W. R. NEUFELD,
City Engineer,
Yankton, S. D.

Sent! The Editors.

REPORT FROM
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Your journal is read regularly in this office and the articles and also the advertisements are studied with interest. Frankly, your journal is of more general interest than any other overseas magazine. How may I obtain duplicates of your three manuals? I feel sure they will be of value in my job of estate development for government housing.

F. A. ROBINSON,
Engineering Overseer,
Housing Construction Division,
Christchurch, New Zealand.

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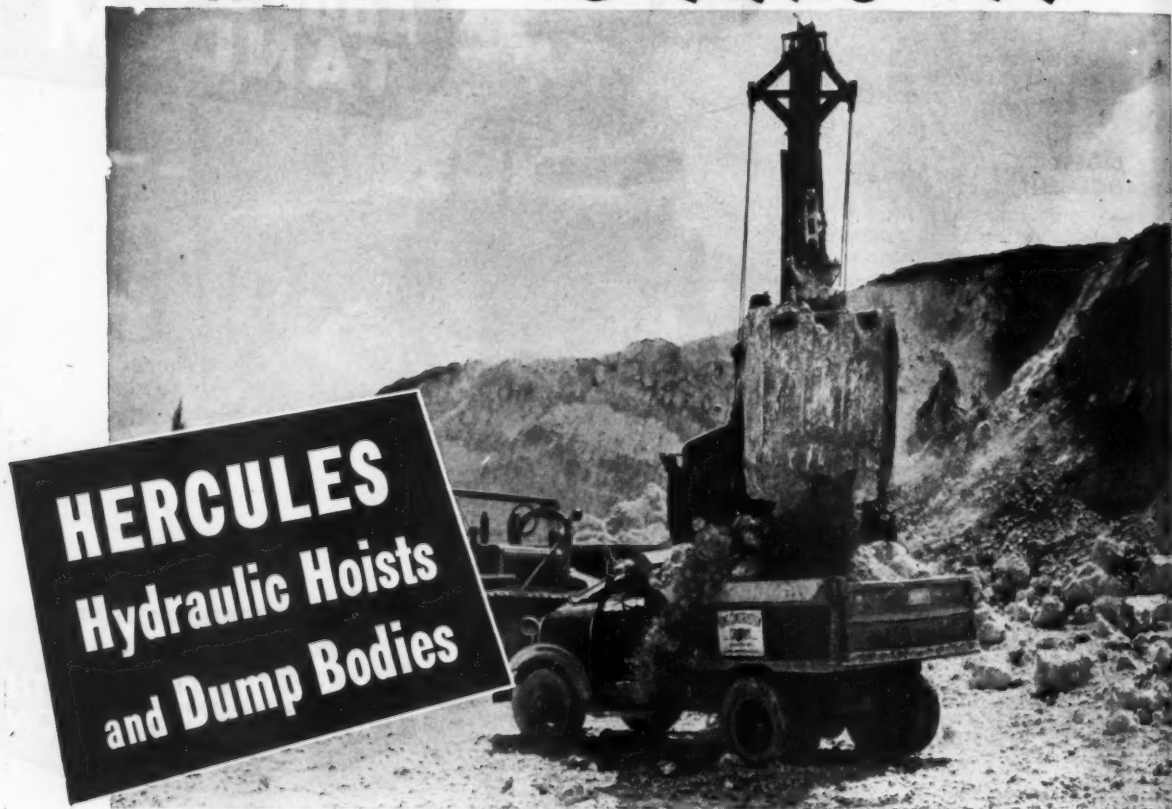
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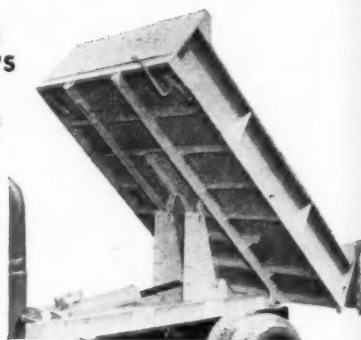
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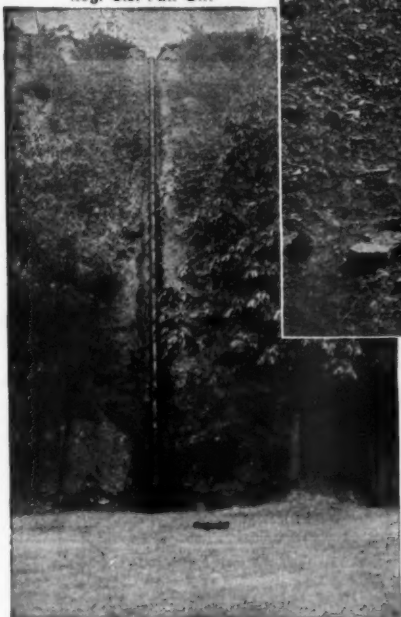
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Above All straight lengths of
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at top to level ground without
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P & P-121



Air Chief at work in Dravosburg, Pa.



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The amazingly simple stages of pick-up, hauling and dumping the detachable containers are shown in the three photos above. In the top photo, driver has backed the truck hoisting unit up to the 8 cu. yd. apartment type container, attached two chains and returned to the hydraulic controls in the truck cab. In center photo, container has been hydraulically lifted into carrying position ready for hauling to disposal area for automatic dumping as shown in the bottom photo.

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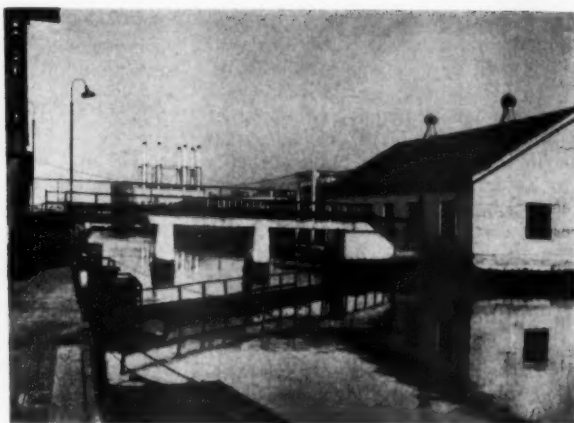
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Courtesy Public Health Service FSA

Typical harbor "debris" pollution.



Courtesy Ford Motor Co.

Oil skimmer, Roulo Creek, River Rouge Plant.

U.S. TO HELP STOP POLLUTION

The following statement in regard to the Water Pollution Control Act has been furnished at our request through official channels and is believed to represent adopted policies and procedures.

FIFTY years of efforts by conservation groups and public health authorities to control the pollution of our water resources were crowned with success during the last session of Congress when an act similar to those which had been introduced in Congress during the past fifty years finally passed both chambers. The Water Pollution Control Act, also known as the Taft-Barkley Act from the name of its sponsors, became Public Law 845 when the President signed it on June 30, 1948.

The new law means a lot to many communities which up to now have been unable to afford an adequate sewage treatment plant. It authorizes the Surgeon General of the Public Health Service and the Administrator of the Federal Works Agency to help individual states control pollution of watercourses by providing technical and financial aid in the form of research and planning grants and construction loans.

None of the money authorized to be appropriated by the Act has been made available. Public Law 845 is

an enabling Act and has to be followed by an appropriation bill. The Federal Works Agency and the Federal Security Agency will ask at the next session of Congress for an appropriation with which to carry out the provisions of the new law.

Because the Act authorizes annual loans of only \$22,500,000, relatively few communities will be able to take advantage of this provision. In addition, the loans are limited to 1/3 of the estimated cost of the treatment works (but not over \$250,000). The community is to provide the remaining two-thirds.

But, what cannot be overlooked is that as small as it is, a start has been made. Because of the provisions of the Act as to annual appropriations for the next five fiscal years, a continuity of programming is possible. Little by little, as new sewage works are built, the problem of water pollution will begin to be solved.

As soon as the money authorized by the Act becomes available many cities which have hesitated to construct modern sewage disposal plants

to eliminate the necessity of dumping sewage in streams, might go ahead with construction.

Building Treatment Works With Government Assistance

The exact procedures of obtaining loans and grants for the building of treatment works are now being drafted by the Federal Security Agency and the Federal Works Agency. According to the law, the state pollution control agency is to get approval of a proposed plan from the Surgeon General before further steps may be taken. The money for paying surveys, engineering and other investigation costs may then be obtained as a grant from the Federal Works Administrator. This grant is limited to 1/3 the cost, but no more than \$20,000 may be granted for any one project.

After this is done, the appropriate sum required may be lent to the municipality, or state or interstate agency.

The order of sequence of priority for projects will be established by the Surgeon General.

The Federal Works Administrator is authorized to hold, administer, refund or sell at public or private sale any bonds or other obligations evi-

dencing loans made under the Act, and to collect the principal and interest on such bonds.

The Surgeon General and the Federal Works Administrator will review all reports of examinations, research, investigations, plans, studies, and surveys made under provisions of the new Law and will review all applications for the loans.

In determining the desirability of projects for treatment works and of approving the loans, consideration is to be given to the public benefits to be derived by the proposed construction, the propriety of Federal aid in such construction, the relation of the ultimate cost of constructing and maintaining the works to the public interest and to the public necessity for the works.

The law provides for the authorization of a million dollars a year for the next five years to be used as industrial wastes research and investigation grants. The money is to be given to the States for expenditure by or under the direction of their respective State water pollution control agencies, and to interstate agencies for expenditures by them, for the "conduct of investigations, research, surveys, and studies related to the prevention and control of water pollution caused by industrial wastes."

"Public Nuisance" Declaration

The Law states that the pollution of interstate waters which endangers the health or welfare of persons in a State other than that in which the discharge originates is considered to be a public nuisance and subject to abatement. Whenever the Surgeon General, on the basis of reports, surveys, and studies, finds that such pollution is occurring, he is to notify the person or persons causing such pollution. Also to be notified of this fact is the State or interstate water pollution control agency in the State or states where such pollution is originating.

The notification may recommend reasonable and equitable remedial measures and shall specify a reasonable time to secure abatement of the pollution. If action calculated to secure abatement of the pollution within the time specified is not commenced, a second notice is to be sent calling upon the state or interstate agency to act.

If, within a reasonable time after the second notification action to abate the pollution is not started, the Federal Security Administrator is authorized to call a public hearing to be held before a board of five or more persons appointed by the Administrator. The board is to make

recommendations to the Federal Security Administrator concerning measures to be taken for abatement of the pollution. If after a reasonable time the pollution still remains uncorrected, the Federal Security Administrator, with the consent of the water pollution agency, may bring a suit to secure abatement of the pollution.

Advisory Board to Review Policies and Program

The Act establishes in the Public Health Service a Water Pollution Control Advisory Board. This board is to review the policies and program of the Public Health Service as undertaken under authority of this Act and to make recommendations to the Surgeon General.

The Surgeon General or a sanitary engineer officer designated by him is to be chairman of this board. The members of the Board are to include one representative each of the Department of the Army, the Department of Agriculture, Department of the Interior and the Federal Works Agency.

The remaining six persons are to be appointed by the President and are not to be officers or employees of the Federal Government. One of the persons appointed by the President shall be an engineer who is expert in sewage and industrial waste disposal, and one shall be a person who shall have shown an active interest in the field of wildlife conservation, and, unless the President determines otherwise, one shall be representative of municipal government, one a representative of State government, and one a representative of affected industry.

The Public Health Service will organize water pollution control activities on the basis of major river basins. Fourteen river basin offices will implement the program in their respective watersheds. Headquarters of the program will be in the Water Pollution Control Division of the Public Health Service.

The basin offices, however, will be the operating centers and will co-operate with state and interstate agencies, the municipalities, and industry. Technical personnel at these offices will have the support of the research and technical service facilities of the Public Health Service laboratory in Cincinnati. The Act provides for authorizations of \$800,000 a year for each of the next five fiscal years to this research station for the construction of facilities for investigations and studies and for the training of control personnel.

In the administration of the Federal Works Agency's responsibility,

field functions will be under the nine Division Offices of the Bureau of Community Facilities, a constituent of the agency.

Pollution Control Not a Simple Undertaking

Government engineers readily confess that they have a tough job ahead of them. Abatement of pollution, as every engineer who ever came close to the problem knows, is not a simple undertaking.

Generally, the control program will be aimed at improving the condition of the worst polluted streams and maintaining the clarity of the less polluted watercourses. Consideration will be given to the various needs of industry, agriculture, commerce and urban development in each river basin. In some states, recreational use of waters would stand very high in relative order of importance. But, consistent with the necessary safeguards for public health and welfare, industrial uses will have a high priority on industrial rivers.

The indiscriminate building of elaborate treatment works is not contemplated. All water uses of the river, lake or stream will be considered and treatment recommended will be based on these uses.

Intermittency in Dosing Filters

According to *The Clarifier* (publication of the South Dakota State Board of Health), Charles Berry found, in operating the Rapid City Army Air Base treatment plant, that by reversing the distributor arms of a trickling filter so that they revolved in the opposite direction, filter growths were dislodged from those parts of the stones protected from direct discharge of the spray in normal operation, and ponding reduced.

An English engineer, investigating the effect of periodicity in application of sewage to filters on their efficiency of operation (see *Sewerage Digest* for October) apparently found that, up to a certain point, the efficiency increased and ponding decreased as the speed of revolution (and consequently the continuity of application) decreased. This is just the opposite of some results reached in this country; in fact, the "Aero-filter" is based on the theory that continuous rain-like distribution over the entire filter area is ideal.

But: the English engineer slowed down his distributor by reversing one arm so that it discharged in the opposite direction. Could this be the answer to this apparent contradiction of experiences?

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Two views of the finished double arch multiplate bridge.

Double Arch Waterway Replaces Bridge

AUSTIN L. MYERS

Supt., Daviess Co. Highway Dept., Washington, Ind.

County forces installed this new bridge at a cost about one-third of the estimate for a steel bridge. The picture above shows the attractive appearance; the article tells how the problem was solved.

SOME five years ago, the Daviess County, Ind., Highway Department suffered the loss of a 50-ft. light, steel truss type bridge. Inasmuch as the road was traveled by two school buses and was also a mail route, it was necessary to get it back into use at the earliest possible date. This was done by the construction of a temporary wooden structure of full-length logs.

For a time this temporary structure took care of the situation rather satisfactorily. The detour bridge location, however, was three feet lower than the regular roadway, thereby creating a high water hazard. The stream, due to a sharp turn, began to scour the sides and bottom to such an extent that after three and one-half years, the bridge was deemed unsafe.

The engineer's estimate for a suitable conventional-type bridge, which would require piling, amounted to \$12,000. Steel was not available nor could the County have afforded this type of structure. However, we were fortunate at this time to locate two 23-ft., heavy multiplate arches; each had an 8-ft. rise. By using a center pier and placing them end to end they would afford sufficient waterway to replace the old bridge.

A 15-ton dragline that could safely play back and forth over the temporary structure was employed to tear out the 52-year-old heavy stone abutments that had supported the original

structure. After removal of the large stones, it was discovered that these abutments had been placed on old-fashioned pole cribbing. This had apparently proven successful.

Soon after excavation for the east footing was begun, a temporary retaining wall had to be built to protect the workmen from cave-ins. From the east bank, the dragline could reach the position for the center pier, and this was excavated. During construction, it was necessary to use a high speed centrifugal pump to keep the excavation sufficiently free of water to permit work.

After carrying the center pier excavation to a depth sufficient to have bearing strength, the dragline was used to handle and place timbers as cribbing to serve in lieu of piling. These were 12" x 16" x 8'. A form for the center pier was built upon these heavy timbers, and the pier poured.

The heights of the end abutments and of the center pier were fixed so as to take advantage of the full 8-ft. rise of the arch. On this particular job, our end abutments were 24" wide on top, 36" wide on the bottom, 36" thick and had an overall length with the stream of 23 ft. The center pier was 30" wide on top, 36" wide on the bottom, 24" thick and also had a length of 23 ft. A very necessary factor was that the tops of all three piers were carried the same eleva-

tion; as the arches had to line up and set square. All abutments and other concrete was reinforced with $\frac{1}{2}$ " square deformed bars. Furnished with the multiplates were steel channels, in which were placed the ends of the arch. These channels were buried flush in the green concrete. Care was taken that the channels for each arch were absolutely parallel and equidistant at all points.

After sufficient time had elapsed to permit the concrete to set, the dragline was again used to hold the plates in place for bolting together.

The 50-ft. end walls and banisters were made 12" thick and were broken in the center of the middle pier with an expansion joint. For further reinforcement to hold the banisters 10" pieces of 1" rod were attached perpendicular to the arch.

The dragline was called upon again for backfilling. Small amounts of earth were placed alternately in the three places to be filled. In this manner, adequate compaction was assured and the arches were not pushed out of line.

The County Highway Department feels that this has been one of the most economical projects for its size that it has instituted in the last several years. By using our own labor and supervision, the total cost was held to approximately \$4,300. Overall construction time was six weeks. We have reason to believe that this bridge will stand up under any traffic required of it, since the dragline crossing back and forth over the bridge doing the backfilling weighed 27 tons.

Second Stage Filter Removals Without Recirculation

Hugh C. Leabee and Randolph L. Smith
Consulting Sanitary Engineers

A RECENT article by Banister and Ellison indicated an average of about 550 ppm BOD for communities in Minnesota and northern Wisconsin for untreated waste. This article pointed out that there are very few of the villages and cities less than 10,000 in population which do not have industrial wastes, such as those from milk, meat and vegetable processing, that materially affect the waste problem. The high average raw waste BOD is, to a large extent, a product of the very rapid expansion of the food industries during the war period but the condition created by the war demand for certain food products appears to be a relatively permanent condition.

Minnesota, in particular, has constructed, during the last decade, a considerable number of Imhoff-fixed nozzle filter-settling tank treatment plants. Most of these plants were constructed in areas where a high degree of treatment is essential. A combination of the increase in strength of waste, plus a similar increase in total volume of waste, has made many of these plants obsolete as regards satisfactory treatment. Prior to the war, two treatment plants were reconstructed, using the fixed nozzle filters as a second stage and constructing a new first stage with high capacity filters. The period of about eight years of operation of these two plants has provided a material back-log of data and a comparison can be made with two high capacity two-stage treatment plants constructed at about the same time. None of these plants included recirculation in the generally accepted sense, though the high capacity plants provided sufficient recirculation during the low night flow period to maintain the filter in a wet condition.

Results of Second-Stage Filters

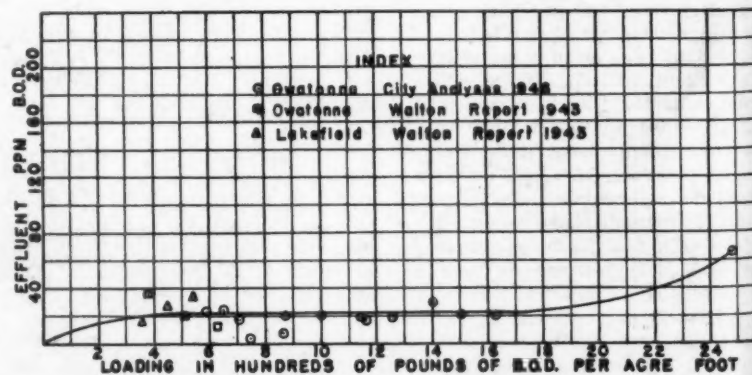
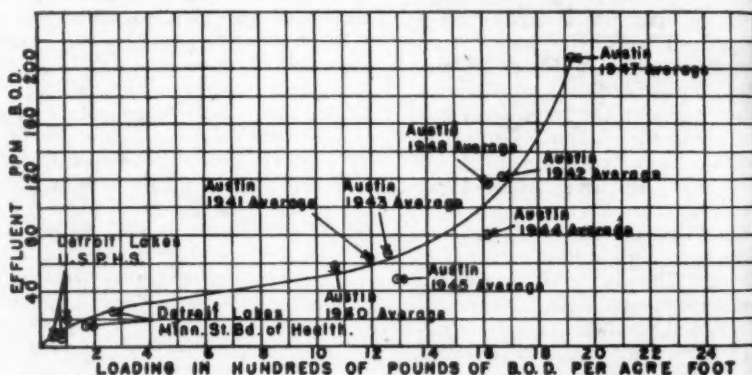
The two graphs included herewith are a tabulation of the available tests of the second stages of these plants. In judging the low capacity filter curve, consideration should be given to the Austin 1944-45 removals over that period. We have been advised chemicals were used as a pre-treat-

ment that were quite beneficial biologically but created operational difficulties that eventually caused abandonment of their use.

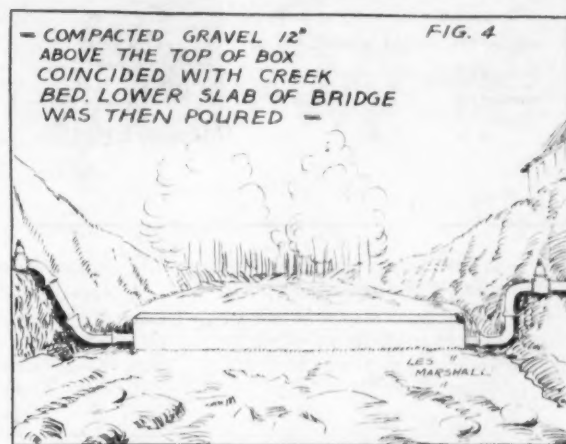
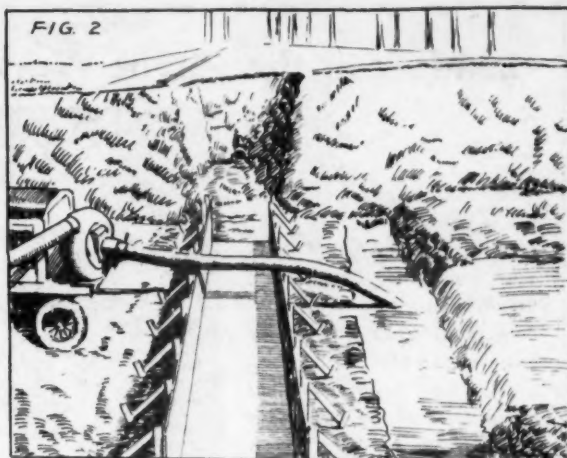
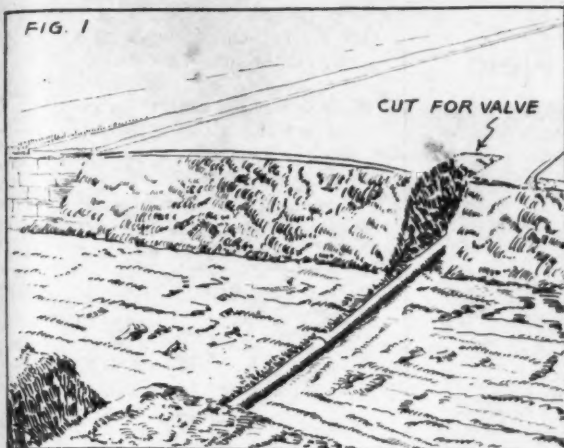
Study of these plants has established the definite conclusion that the biology of two stages of a two-stage plant are radically different; and data that applies to the first stage of a biological filter plant cannot be applied to the second stage, under the conditions outlined above. The two stages must be designed separately for the specific conditions of either a first or a second stage. The conclusion must also be drawn that in order to maintain an active, virile flora, the minimum loading of organic material in the waste must be considered as well as the maximum loading.

In the reconstruction of a fixed

nozzle filter, consideration must be given to the hydraulics of the increased flow, the aero-dynamics of the increased air requirement and the possible loss of efficiency by excessive volume of flow. In connection with the study of these fixed nozzle filters, in all cases where the dosing tank design was adequate to provide short intervals of time between dosages, with non-sustained application of the liquid to the filter surface, the removal of organic material was at least equal to that provided by the rotary distributor low capacity filter plants. Our conclusion, as to the relative advantages of the two general methods of distribution of sewage over a low capacity filter is that both, with equally sound design, will produce very close to identical removals.



Relation between loading and effluent, no recirculation. Top, second-stage low capacity filters; bottom, second-stage high capacity filters.



Laying a Water Main Across a Creek

LESTER R. MARSHALL

Supt. of Water, Waverly, N. Y.

Illustrations by the Author

OUR village water department last year undertook the renewal and relocation of a short section of 6" cast iron water main crossing a creek. The job was necessitated by the construction of a concrete slab bridge by the State department of Public Works across the stream.

About a year prior to the actual beginning of the work, the author had submitted plans outlining in detail our portion of the job and these plans have been approved. One requirement made the sleeving of the new main a necessity and we decided on a concrete box culvert poured in place on the creek bottom.

The job had almost been forgotten when, more or less suddenly, the contractor moved into the site to begin the bridge work. We, too, moved in. While he was tearing out the old bridge structure we hauled in our materials—pipe, valves, fittings, etc., and pre-fabricated the culvert forms on the blocked-off highway.

Starting the Job

Fig. 1 shows the exposed old main which had to be lowered about 40" below the creek bed. To supply the 12 or so consumers on the portion affected and also as a permanent feature of the finished job a valve was installed on either side in the ex-

cavations shown in Fig. 1. Working from our plans we made precise cuts on the old main and removed the portion in the creek; then we dead-ended both sides with 6" gate valves. The contractor then excavated to the required elevation for our form work. This form was thirty feet long with an outside cross-section thirty inches square and the entire thirty feet was lowered into place as a single unit by a crane. Fig. 2 shows the bottom and outer sides in place and brace. Everything looked rosy but do you notice that 500-gallon a minute pump and the flowing stream? This stream is called "Dry Brook" and it was bone dry when we started. Now we got a

Leaders in the Public Works Field

With unusual personal pleasure, we initiate this series with Bernard Gray, General Manager and Chief Engineer of the Asphalt Institute. A graduate of Tufts College, which has awarded him two degrees, he has long been a leading figure in the highway field. He is just about our ideal of an engineer, for he combines with sound engineering knowledge, the broad viewpoints of the leader and a fine personality.



Bernard Gray

very heavy rain and a flash flood. Even this pump and two other small pumps couldn't handle the water. It was two days before we could do anything and of course there was plenty of gravel, etc., to remove first.

More Rain

After a couple of more flash floods we managed to pour in a 6" bottom with $\frac{5}{8}$ " dowels on 12" centers to tie into the sides which were poured later. Fig. 3 shows one end of the job with

two quarter bends to bring us down to the bottom of the box. Note the ledge in the side of the culvert formed to carry a 6" concrete roof (the last task before backfilling began). The opposite end also had to be lowered with two 45's and a short nipple (due to the difference in elevations of the existing pipe). A Dresser coupling connected a full length and a partial length about mid-point in the box culvert.

Fig. 4 shows the completed box and piping complete ready for the backfill to 12" above the roof. This was a mighty task in itself requiring tamping in 4" layers some 100-odd tons of bank run gravel (State Spec. 119-S).

Waverly, N. Y., is a town of about 5400 population and maintains only a small operating force for its water department. We were naturally proud of the gang for doing all the diversified tasks in connection with this seemingly simple job. The only help we had was in rented equipment—a power shovel, large pump, concrete vibrator and the purchase of ready mixed concrete. Completed, the job cost \$1,300 which included everything. Even with the delays due to high water we finished in three weeks.

(P.S.) The contractor finished his bridge with no interruption and just one light rain that hardly laid the dust.

Treating Glue Plant Wastes

At the animal hide glue manufacturing plant of Delany & Co., in the edge of Philadelphia, treatment facilities have been installed to handle the wastes discharged from the plant. The plant is operated six days a week, 24 hours a day. The liquid waste varies from 10,000 to 75,000 gallons per hour, averaging 47,500 gph., or about 1.14 mgd. BOD averages around 1,000 ppm. and suspended solids about twice as much.

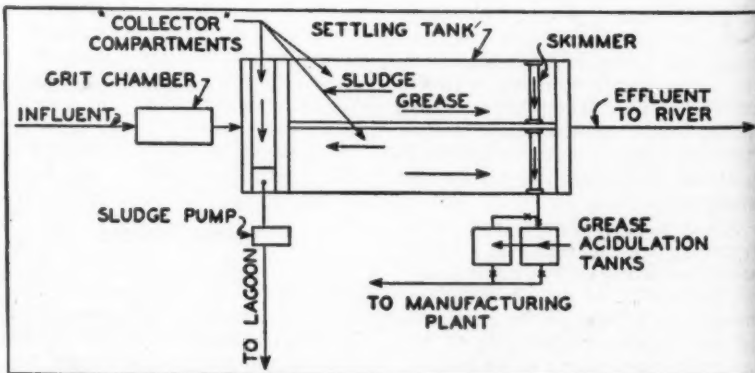
The treatment plant consists of a grit chamber, a settling basin, a lagoon for the disposal of sludge and grease recovery facilities. The grit chamber is of concrete, 10 ft. wide, 39 ft. 6 ins. long and 3 ft. 5 ins. average water depth. Grit is removed weekly by a crawler crane and discharged to a lagoon.

An existing concrete tank was remodeled to provide a settling basin having a detention period of 3.1 hrs. This is 100 ft. long and 33 ft. wide with an average water depth of 5 ft.

9 ins., and is equipped with two 16-ft. wide Link-Belt Straightline sludge collectors, with a cross-collector at the influent end of the tank. Grease is removed from the surface by a Rotoline scum skimmer, and is acidulated for recovery. About 1,100 lbs. are recovered daily.

In passing through these processes of treatment, 30% of the BOD and 65.6% of the suspended solids are removed. Because such a large part of the solids are finely divided or colloidal, the results are considered excellent.

Albright & Friel, Inc., were consulting engineers on the plant, and these data are from *Link-Belt News*, house organ of Link-Belt Co.



Plant layout for treating glue manufacturing wastes.



Snow fighting procedures: left, spreading abrasives; right, widening operations.

MICHIGAN PREPARES FOR WINTER

C. M. ZEIGLER

State Highway Commissioner

WITH the addition of new snow plows and sanders and the replacement of wornout equipment discarded after last year's snow removal program, the Michigan State Highway Department is better prepared than ever for its annual job of keeping the 9,400 miles of state trunklines free from ice and snow. With the equipment purchased last year, the State Highway Department has 180 snow plows, 120 ice sanders and 12 rotary plows, operating in all of the counties of the state. Two of the rotary plows are of the wing type,

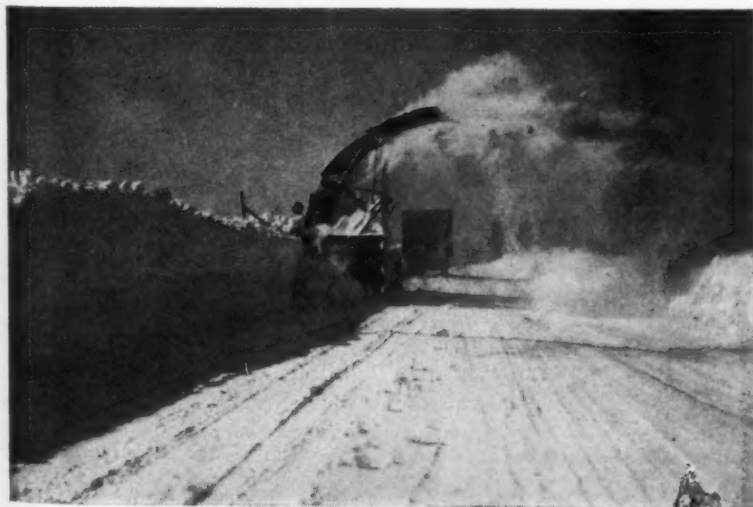
mounted on tractor-graders and intended for use in the deep snow regions of the north. One is at Mio and available for use in 13 counties of the northeastern tip of lower Michigan. In emergencies, it can be shifted to southern counties. The other rotary wing plow is located in Manistee to serve the northwestern section of the lower peninsula. Both plows will operate in counties where the Road Commissions handle trunkline maintenance as well as in areas in which the Highway Department has its own crews.

Each of these units has a large rotor fan at the end of the sidewing, capable of throwing the snow 100 feet off the roadway. Its chief purpose is to slice off high roadside banks so that wind currents can blow the highway clear of light snow which might otherwise accumulate in piles or drifts. They are designed to throw rather than push the snow off the roadway. During the stormy season, snow must be thrown far back from the highway. Otherwise, high banks pile up along the road, making it difficult to clear the road after subsequent storms.

Michigan's snow removal crews go into action as soon as a snow storm starts and keep operating until all trunklines are clear. Trucks equipped with underbody blades start clearing traveled roads before the snow is packed by traffic. When the snow gets too deep for this type of plow, light trucks with side delivery plows take over. These stay out until the snow stops or until enough snow has fallen to require heavy trucks with side delivery plows. After the regular equipment has gone through, the heavy-duty mechanically-powered rotary wing plows move in to slice off the high roadside banks.

Ice Removal Problems

Besides snow removal, highway workers have an equally difficult task in combating ice conditions. Hills, curves and intersections must be



Widening a cut with a rotary snow plow.

sanded and other steps taken to clear the road of ice or packed snow after each storm. It is at these points that the sand trucks start operating to remove the hazards of slippery roads. If conditions are such that a layer of snow glazes over and causes an icy condition, an application of chemically-treated abrasive is made. As soon as the chemical in the abrasive has loosened the ice, it is peeled off by trucks equipped with scrapers. Ice control requires that emergency measures be taken as soon as ice begins to form.

Last year, Michigan spent approximately \$3,000,000 to keep its highways clear of snow and ice. When normal winter conditions prevail in the state, in southern Michigan approximately 75 per cent of winter maintenance money is spent on ice control, the remainder on snow removal. In the central part of the state the division is on a 50-50 basis and in the northern portion, 65 per cent goes for snow removal, 10 per cent for snow fences and 25 per cent for ice control. Last year, however, unusually bad ice conditions necessi-

tated the spending of 51 per cent of the total winter maintenance money on ice control throughout the state.

It is the responsibility of the State Highway Department to maintain roads in the best possible condition consistent with traffic volume, and although the cost of snow removal in Michigan may seem high to the average person it must be remembered that the economic welfare and development of the state is dependent on a well maintained and adequate highway system over which raw and finished materials may be moved to and from our factories and food products from our farms to markets. It must be recognized, too, that any condition which delays the normal flow of traffic also means a loss of gasoline tax revenue, which is the Highway Department's sole source of income. Therefore, clear highways in winter mean more revenue and help to pay for snow removal work done on them.

An efficient snow removal program is not only extremely important to the everyday life of our people, but it is also insurance against accidents.

Haverhill metropolitan region; and primary treatment plants at Amesbury, Newburyport and Salisbury in the Newburyport Harbor region. The total cost is estimated to be \$27,581,100 and an annual cost for fixed charges, maintenance and operation of \$2,268,480, less an income of \$929,460 from the sale of grease. The trunk sewer plan was estimated to cost \$56,392,800.

In his report as engineer of the board, Thomas R. Camp states that, since the sewerage systems of Lowell, Lawrence and Haverhill are on the combined plan, overflows to the river of mixed sewage and storm water will occur during storms of an intensity which, the records indicate, may be expected an average of 5 or 6 times a month. While this will produce locally an undesirable amount of pollution for a short time, less than 3% of the domestic sewage will reach the river.

The trunk sewer plan considered comprised 36.5 miles of 6.5-ft. to 11.25-ft. sewer, and a treatment plant at the outlet with grit chambers, carbonation channels, grease flotation and flocculation tanks, primary settling tanks, chlorination, sludge digestion and storage, elutriation, vacuum filters, pumping and sludge handling equipment.

The two activated sludge plants for the regional treatment plan include grit chambers, carbonation channels, grease flotation and flocculation tanks, primary settling basins, aeration tanks, secondary settling basins, chlorine contact chamber, sludge and grease pumps, sludge thickening tanks, sludge digestion and storage tanks, elutriation tanks, vacuum filters, power (dual-fuel gas engines) and blower equipment. The Lowell plant was designed for 23.4 mgd average and 30.2 mgd peak flow. The Lawrence plant was designed for 38.5 mgd average and 64.5 mgd peak.

The Haverhill plant was designed for 9.46 mgd average and 17.1 mgd peak flow, and includes a mechanically cleaned rack and shredding equipment, grit chambers, units for flocculation and grease flotation, primary settling tanks, chlorine contact chamber. Sludge would be treated as at the other plants. No carbonation channels are required at the Haverhill plant because the wastes are not highly alkaline as is the case at Lawrence and Lowell.

For the Amesbury, Newburyport and Salisbury plants only primary treatment is contemplated, including comminutors, flocculation and grease flotation, sedimentation, sludge digestion and open sludge drying beds.

Plans to Reduce Pollution of the Merrimack River

OVER 20 years ago the Massachusetts Department of Public Health began serious consideration of the sanitary condition of the Merrimack river, and studied two plans for improving it — (1) a trunk sewer along the river to discharge into the ocean off Plum Island, and (2) local treatment plants along the valley. The former was recommended to the legislature, which took no action except to establish, in 1935, the Merrimack River Valley Sewerage District and Board. In 1945 a Joint Board was established, consisting of the Merrimack River Valley Sewerage Board and the Department of Public Health. This board employed Thomas R. Camp as consulting sanitary engineer and the firm of Thompson & Lichtner Co. to supervise and interpret soil explorations.

It was found that before the river reached Lowell, the lowest D.O. recorded was 5 ppm and the highest B.O.D. was 5 ppm. But from Lowell to the sea the river is increasingly polluted, unsightly in appearance and depleted of oxygen to a degree inimical to aquatic life. Three schemes were considered: 1—Flood control works by the Federal Government to

increase the capacity of the stream to handle pollution during dry weather. 2—A trunk sewer adjacent to the river to intercept polluting outfalls and discharge the effluent after treatment into the Atlantic Ocean. 3—Regional treatment plants, discharging their effluents into the river. The first, they decided, would not produce the desired results. Comparing the other two, on the basis of plans and estimates made by their engineer, they recommended regional treatment plants because they would reduce the load on the river to within reasonable limits at considerably less cost than the trunk sewer scheme. Moreover, the latter would substantially reduce the power and water resources of the river; might, because of its length, cause odors from stale sewage; could not be integrated so well into a program where benefits accrued in proportion as money is expended; and would concentrate the discharge of sewage in close proximity to a principal bathing beach on the Atlantic coast.

The plan recommended includes an activated sludge plant for the Lowell metropolitan region; a similar one for the Lawrence metropolitan region; a primary sedimentation plant for the

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Toronto Data on

Street Cleaning and Refuse Collection

THE Department of Street Cleaning of Toronto, Canada, has charge not only of the cleaning of the streets, including snow removal, but also of the collection and disposal of the city's refuse. In 1947 the population was 695,300 and the mileage of improved roadways that were swept was 576.6. The total expenditure of the Department in 1947 was \$3,486,114, of which 16.0% was spent for street cleaning and 18.8% for snow removal and cinderling. Refuse collection and disposal required 50.5% of the total expenditure. The remaining 14.7% was for garage, shop, yard and administration.

Snow Handling

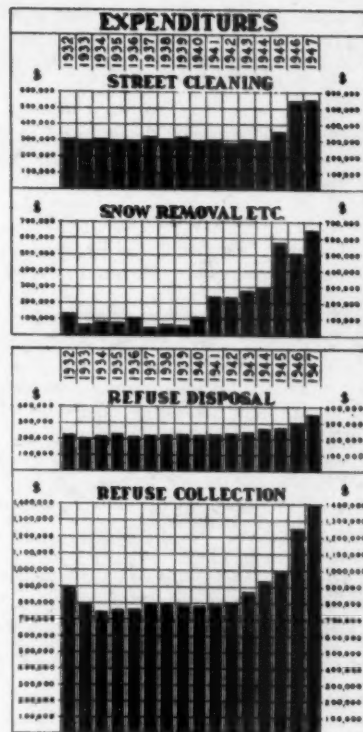
It is seen that snow removal and cinderling in this Canadian city required more of the taxpayers' money than did street cleaning, which included road oiling and cleaning 22,500 catch basins. The snowfall in 1947 totaled 72.1", which was the third greatest in 33 years, the maximum having been 81.2" in 1944.

Plowing equipment is used for pushing deep snow to the sides of the road and for clearing drifted areas. Snow loaders pick up the windrows at the side of the roadway. A snow blower is used to throw the

snow over parks or vacant areas where these are available; otherwise to discharge it into trucks. The amount of mechanical equipment used in this work is unusually large. H. D. Bradley, Commissioner of Street Cleaning, says that "The plow organization can plow all streets in the city within a period of eight hours; that is, push the snow to the curb on all streets."

Residence streets, however, where the snow is not removed, are plowed only when the snow has fallen to a depth of 6 inches or more. Plowing without removal permits movement of traffic more freely, but interferes with access to residences or other buildings, and when roadways are narrow it pushes snow onto the sidewalks. Snow is plowed to the side of the roadway on the entire 576 miles of streets. On 150 miles of business streets and on through highways and bus routes, the snowfall is removed totally from curb to curb. Citizens are required to clean their own driveway approaches.

In doing the plowing, the Department uses its heavier street cleaning and refuse collection equipment—chiefly ash and garbage trucks, 60 truck drivers having been trained to operate them in snow plowing. Spe-

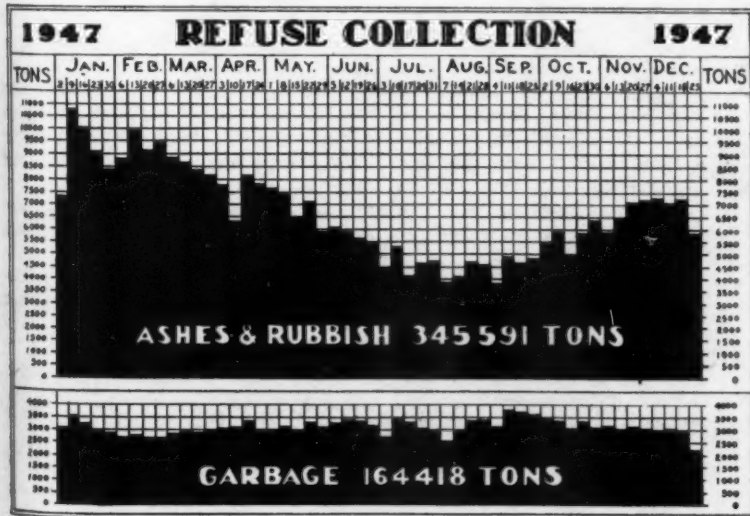


cial equipment for snow handling includes 3 Snogos, 6 Sicard snow loaders, a Barber-Greene snow loader and 3 Barber-Greene bucket loaders.

Concerning snow loaders, Commissioner Bradley says: "Each machine has a manpower replacement value of 500 men, and such equipment can work under conditions that would be difficult or impossible for labor to work under"; and such equipment is just as essential as is fire-fighting equipment.

For disposing of the snow removed by trucks, there is only one possibility—hauling to park lands, vacant areas and the waterfront. The sewers can take a normal amount of freshly fallen snow, but stoppages are likely to occur if compacted snow, and the materials that accumulate on the windrows formed by plowing, are dumped into them.

Ice control presents a difficult problem. If salt-treated abrasives are not distributed during snowfalls at over 3,000 points throughout the city, comprising hills, grades, curves, stop streets, car stops and pedestrian crosswalks at intersections, the snow becomes compacted by motor cars, causing an extremely slippery condition. If only sand and cinders are distributed, these are windswept off the icy surface or are covered by subsequent falls of snow. But if salt is added, if only a slight snowfall occurs, the area treated will, within



a short period, be clear of snow; or if the snow continues to fall, slush will develop which will be removed by scrapers as routine duty by regular employees. (In Toronto it may be above freezing at noon hour and below zero at midnight, with light intermittent snowfalls.)

Street Cleaning

During 1946 and 1947, 15 mechanical sweepers were purchased—7 Austin-Western and 8 Elgin. These are considered a step toward greater cleanliness, particularly on those schedules where the machine precedes the street flusher, of which there are ten in service. These are equipped with 2,000-gal. tanks and 4 nozzles, and are used 16 hrs. a day for 8 months of the year. Every street is flushed every fifth day, and main thoroughfares nightly also. There are also 2 leaf loaders.

During 1947, 300 patrolmen were employed, collecting 113,616 cu. yd. of sweepings from 9,562,388 sq. yds. of improved streets at a total cost of \$469,318.

There are 22,500 catch basins to be cleaned each spring and fall, and after each rainfall where located at the bottoms of hills. Until 1933 these were all cleaned by hand, a very unsatisfactory method. In that year the department purchased two autoeductors, which proved to be most economical and effective, and four more were ordered for delivery in 1948.

Refuse Collection

Combustible refuse is destroyed in four incinerators, and householders are required to place all combustible matter in one receptacle and non-combustible in a separate one. The combustible matter is called "garbage," but includes also "discarded household waste, wearing apparel, sweepings and all refuse matter capable of consumption by fire, except ashes"; but in the case of hotels and restaurants, it includes only animal and vegetable matter. All kitchen wastes are wrapped in paper, which is a sanitary method of handling, insures a minimum of water in the container and provides fuel for the incineration; the cans are kept cleaner and the garbage does not freeze to them.

In 1947, 164,418 tons of "garbage" were collected and 345,591 tons of ashes and rubbish, at a cost of \$1,399,191 plus \$351,422 for administration, insurance, etc. The open garbage trucks are being replaced with fully enclosed automatic loading vehicles, of which 125 are in use. Of these, 13 are Gar Wood Packers, purchased in 1947.

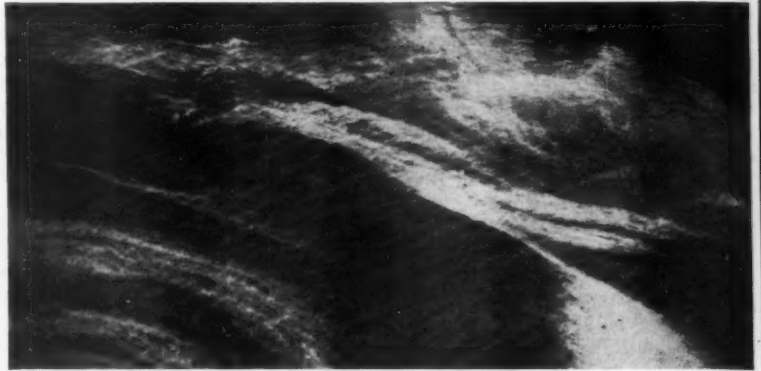
Regular collections from residences and business places are made on Mondays, Tuesdays, Thursdays and Fridays. Collections are made from 135,108 dwellings and buildings, 13,510,800 collection calls having been made during the year.

Equipment

The department owns (as of 1947) 261 pieces of motor vehicles. These include, in addition to those already mentioned, 82 2-ton wooden dump trucks, 20 3-ton wooden dump trucks,

3 service trucks, a 5-ton oil truck, 9 tractors and 2 bulldozers. One of the wooden dump wagons was purchased in 1930, a few in 1931, but 174 pieces of equipment have been purchased since 1940, and 65 of them in 1947.

The information given in this article was obtained from the Annual Report of the Department of Street Cleaning for the year ending December 31, 1947, made by H. D. Bradley, Street Commissioner, Toronto, Canada.



Checking flow of pollution: outfall eddy is lower left. Fluorescin shows as light colored area at right.

Beach Pollution Tested by Dyed Water

W. J. GRANBERG

TO GAIN information for a survey to determine the extent to which sewage is polluting Seattle's salt water beaches, the city and Washington state public health officials turned to a war-born technique to trace the path of sewage from an outfall in Puget Sound.

Fluorescin, a dye called "tell-tale green" by Navy flyers during the war who carried it in their emergency kits for use if they were forced down while over the ocean, was poured into the water at the eddy in Puget Sound caused by the North Trunk sewer outfall. This outfall carries 60 per cent of Seattle's sewage and the problem was to determine whether tides and currents carried pollution to nearby bathing beaches.

Forty pounds of fluorescin were turned over to health officers by a naval reserve training unit in Seattle. A half pound of the dye was dropped into the eddy every half hour for several hours, using a small boat. In the air, from a naval training airplane, Emil C. Jensen, chief engineer for the Washington health department, watched the now green-colored sewage and checked its speed and

direction on tide and current. At the same time, observations were made from boat and shore.

The test revealed that the course of the sewage could be traced, by use of the dye, for three hours before the color was dissipated. The bright color made tracing the course of the sewage an easy task. As tests continued, colored photos were taken in order to have a permanent record of the course of sewage from the outfall.

The beach pollution study was made under the direction of Dr. Abel Wolman of Johns Hopkins. Bacteriological samples of water from the beach areas were taken daily and these, along with the studies on course of the sewage, will answer the pollution question.

The technique of using dye to determine the course of water was used by the Army during the war in studying river currents and has also been utilized in tracing ground water pollution of wells. However, Mr. Jensen believes the Seattle experiment marks the first time that fluorescin and the airplane have been used in the public health field to study the course of sewage disposal.

Constructing a 2,300,000-Gallon Steel Reservoir

M. J. SHELTON

Manager and Engineer, La Mesa, Lemon Grove and Spring Valley Irrigation District

THE supply of irrigation and domestic water to a large area east of the City of San Diego, California, is performed by the La Mesa, Lemon Grove and Spring Valley Irrigation District. The area served is one of the fastest growing communities in the country. Like most organizations having the responsibility for water supply, the District has been faced with a heavy back-log of construction work brought about by the lack of materials and labor, as well as by cessation of construction during the war years. During the seven-year period, 1940 to 1947, the number of consumers was increased two and a half times. Some of the most rapid growth has occurred in the City of El Cajon.

Mountain runoff is stored in reservoirs and transported into the District through a 42" pipeline located on a bench which had been the route followed by the original wooden flume which was abandoned in 1937. This line skirts the valley in which El Cajon is located, at an elevation approximately 100 feet above the floor of the valley. Since 1937 there has been only one storage reservoir of 200,000 gallons capacity to afford standby protection. All water delivered into the system has to be pumped

approximately 300 ft. at a plant which is about ten miles distant and in the event of power failure, flow in the 42" line at El Cajon stops within about half an hour. It, of course, was apparent that storage should be made available for proper protection.

Finding a Reservoir Site

Reconnaissance quickly showed that no canyons were so located as to provide storage by construction of a small dam or dyke. There was found on the 42" line opposite El Cajon a small parcel of land adjacent to the flume and immediately below it, where a small redwood reservoir had been located. This area, which was still in the name of the City of El Cajon in the form of an easement was transferred to the District. The site was cleared of trees and a contour map made from which it was determined that the site could be excavated sufficiently to permit construction of a tank 100 ft. in diameter and that a road approach to the lower level could be developed. Likewise, the flume bench had to be widened to permit delivery by trucks of materials weighing as much as 17 tons, and an approach



Putting second course plate in place.

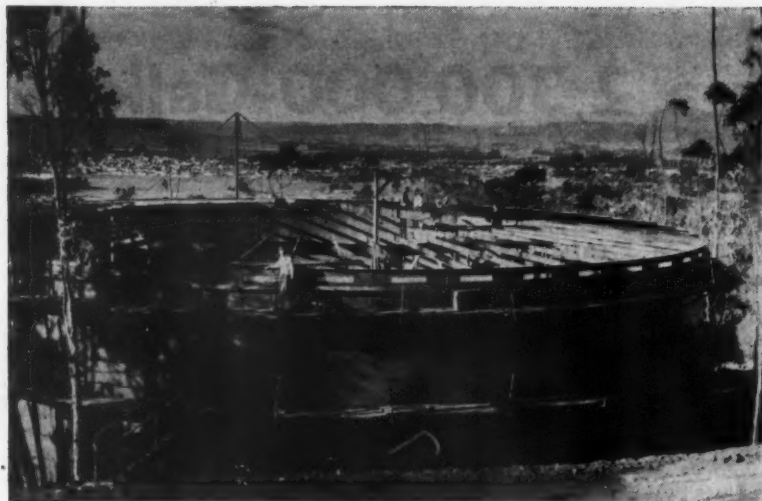
had to be made to the paved County Highway. To reduce future maintenance, this road was paved with a "desert mix" about 2½ inches thick. Excavation of the reservoir site was accomplished by use of two bulldozers and one roter together with plenty of drilling and shooting with the aid of two compressors. This work was completed within three weeks. The total excavation amounted to approximately 8,000 yards. This was disposed of as fill at the edge of the site by arrangements with the adjoining property owner who now has a house site overlooking the valley and a recorded agreement with the District for ingress and egress.

Details of the Tank

Plans and specifications were prepared by the District and bids taken on two schedules, namely: concrete and steel. Since construction was of steel, details will cover only this phase of the work. In general, the specifications were based on the American Petroleum Institute Specification for All-Welded Oil Storage Tanks, API Std. No. 12-C, 6th Edition, August 1944 except that the maximum fibre stress in tension, compression and bending was limited to 15,000 pounds psi. The tank is 100 ft. in diameter and 40.5 ft. high to the water line. To improve the appearance of the tank, the 12" spillway pipe and the spillway fun-



Third day on the job—all bottom sheets in place; five first course sheets tack-welded.



Framing the roof of the El Cajon tank. This view shows construction well under way.

nel, 2' x 3', were located inside. A 6" floor drain is connected to the spillway under the floor. Access to the roof is gained by a walkway from the upper level road located on the flume bench. A ladder continues to the roof where there is located a manhole below which is placed the inside ladder. Painter trolleys are on the inside and outside to provide safe and easy maintenance.

A 6" sand cushion of cleaned and graded sand was spread over the subgrade and after erection of the tank, SC-2 oil was pumped underneath the bottom of the tank through 2" pipe nipples in the floor in sufficient quantity to fill the voids in the sand cushion and rise 6" inside of a temporary dam located about three feet outside the tank. A screened 18" rotor type air vent was placed at the peak of the roof and a 6" screened vent at the top of the tank was required for 50% of the circumference.

Completion was called for in 120 days. The successful bidder, Western Pipe and Steel Company of Los Angeles, California, had sufficient steel on hand, gave the District a work schedule at the time of awarding the contract and maintained that schedule throughout the contract. Shell steel was rolled at the plant and all steel was delivered to the site by truck and trailer, unpainted. Erection was accomplished easily and quickly through the use of rollers sliding along on the top edge of the last course laid. The District welding inspector made inspections daily and made a detailed report of where work was in progress, what operations being performed and the quality of the work. The shell, columns

and bottom were coated with Barrett's Coal Tar enamel in accordance with AWWA Specifications 7A.5—1940 and 7A.6—1940, insofar as they apply. This was put on in strips about 8" wide and lapped 4" with the result that all areas were covered with two applications. The surfaces were then tested with a 10,000-volt spark and all holidays marked and repainted except that in the case of the columns, which were made up of two channels, testing was practically impossible so an extra coating of enamel was given instead. The exterior of the tank was given a prime coat of Old Colony Zinc Chromate Primer 67-630 and one coat of Old Colony Aluminum Duralistic 68-110, except that the lower 30" was painted with black Inertol Standard. All outside painting was done by brush. The under side of the roof was given two coats of Bitumastic odorless and tasteless "Tank Solution."

Other Design Factors

Flow of water into the tank is controlled by a Clayton valve which also acts as a check valve in the event the transmission line goes out of service thereby keeping the water in the tank as standby for El Cajon. The size of the tank was dictated by the area available and the hydraulic gradient of the transmission main. The result, however, is that the tank affords about 48 hours of standby at present. It is estimated this will be reduced to about 24 hours of standby when the area is fully developed.

The following are a few points of general interest to the average reader: First course sheet plate, $\frac{7}{8}$ " x 8';

second course plates, $\frac{3}{4}$ " x 8'; third course plates, $\frac{1}{2}$ " x 8'; fourth course plates, $\frac{5}{16}$ " x 8'; fifth course, $\frac{1}{4}$ " x 9', with vents cut out. Bottom plates are $\frac{1}{4}$ ", with sketch plates $\frac{5}{16}$ "; and roof plates are $\frac{3}{16}$ ".

Total weight of steel is approximately 250 tons, and total weight of welding rod is about 3,900 pounds on 6,734 feet of seams.

Experiments are being carried on, to continue approximately a year, with plates hanging inside the tank to determine the amount of cathodic protection, if any, that may be required.

It may be of interest to point out a few changes made more recently in specifications for another tank.

1. A concrete footing should be constructed under the shell to carry its weight without causing the slight bending of the bottom plates. Sand cushion with SC-2 oil under the bottom should be used in conjunction with this footing.

2. Roof plates should extend beyond the sheet sufficiently to eliminate roof runoff entering the screened vents. We specified a 1 ft. overhang on our latest tank.



Closeup of second course plate being placed with aid of rollers.

3. AWWA Standard Specifications for Elevated Steel Water Tanks, Standpipes and Reservoirs, No. 7H.1—1943, August, 1943, were used instead of the API Standard Specifications in that they are more appropriate for water storage.

Cost of excavation was \$8,300, of the tank \$67,500 and total cost was approximately \$85,000 which includes cost of the grading and surfacing of 2,000 feet of entrance road, sand cushion, SC-2 oil, Clayton valve control and miscellaneous work performed by the District. The lowest bid for concrete construction was \$99,200 as compared with the steel bid of \$67,500.

Putting Through a 55-Mile County Road Program

NEIL WOODLE

County Highway Superintendent

FOUR years ago a few bold souls amongst the Board of Meade County Commissioners, together with the meager engineering personnel in the County Highway Department, committed themselves to an initial 55-mile road-building program under the Federal Aid Secondary set-up. Within the next few months, we will see the final realization of that four-year-old dream.

My part in this project, though small, perhaps, has given me considerable personal satisfaction. A lifelong resident of Meade County, I had just started to work for the County Highway Department when I was made chief of party for locating the first thirty-two mile section of the project. In 1947, the Board of Commissioners appointed

me County Highway Superintendent. Due to our lack of trained engineering personnel, it was deemed advisable to contract the plans on the final twenty-three mile section.

It is fortunate, perhaps, that at the time the project was launched we didn't foresee all the obstacles we were destined to encounter. These were many and varied in degree of seriousness. The considerations of local county politics; the excessively elaborate and therefore expensive design standards required by the Public Roads Administration at that time; our lack of adequate equipment and personnel are just a few examples of our problems.

Originally, the plans called for a negotiated contract between the County and the P.R.A., the County

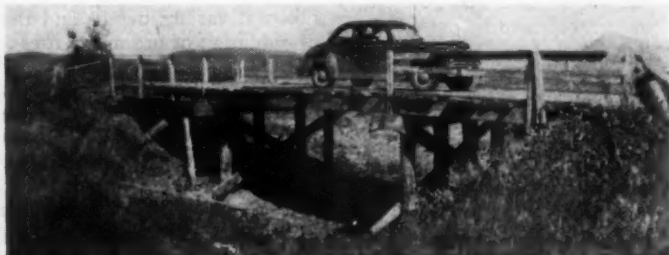
to furnish all material and to perform all the construction with County forces and equipment. In the spring of 1948 it became apparent that to carry on the then scheduled work would result in complete stoppage of all other county construction and maintenance. Therefore, a call for bids was issued and contracts were awarded to the J. F. England Construction Company of Rapid City for the grading and to the Chase Construction Company of the same city for the gravel surfacing.

In the total 55 miles there were approximately 600,000 cubic yards of earth to be moved. This, in itself, is not excessive except for the fact that it was widely scattered. There were approximately fourteen miles of scraper work and the balance had to be cast in. The design called for a minimum 22-ft. top with 8% maximum grade. Though following an old road, many curves were eliminated and those remaining were flattened out considerably.

One of the most interesting features of the entire project involved bridge eliminations. In all, a total of fourteen old wooden bridges were replaced with Armco Multi-Plate structures varying in size from their Type "C" pipe-arch with a rise and span of 72" by 107" to a 144" round pipe. These, in several instances were multiple lines and all were designed to take excessive and fast run-off. We estimate that between \$10,000 and \$12,000 have been saved in bridge replacement.

With the exception of two I-beam viaducts, one spanning the Belle Fourche river, all drainage in addition to the multi-plate structures mentioned above, is to be handled by corrugated metal pipe ranging in sizes from 15" to 66". A total of 151 tons of corrugated pipe was required, plus 153 tons of multi-plate.

At this writing it appears that with a reasonably fair break from the weatherman, by the time 1949 rolls around, we can look back on four years of hard work and forward to many years of satisfactory road enjoyment on this fifty-five mile project. It is our personal opinion here in Meade County that the Federal Aid Secondary road program is a distinct advantage to all of us.



Top, type of original wooden bridge. Center, three 138" multiplate lines being placed. Bottom, backfilling on them completed.

Interim Report on Results of Sanitary Research at University of Florida

JOHN E. KIKER, Jr.

Associate Professor of Public Health Engineering

SANDS of varying effective sizes, uniformity coefficients, and depths, are being loaded intermittently at controlled rates. The rates have been changed from time to time, and the intervals between dosings have also been varied. Complete analytical data are kept with the view of establishing the economical relations of loading, sand size, and depth of beds. Some of our conclusions are:

- (a). The removal of suspended solids is independent of the loading rate for conditions under which we have been operating.
- (b). Conclusion by other workers, that the BOD test as commonly performed is not a good index of the efficiency of treatment, has been confirmed.
- (c). The percent oxidation of applied nitrogen is a better yardstick than BOD values for determining the efficiency of treatment.
- (d). Split dosing (i.e. dosing the filters twice instead of once daily) can be used to increase substantially daily loading rates.
- (e). For comparable results under average conditions of sand size and depth, the dosing rate in central Florida can be increased from 50 to 75% above the rates permitted and used as standards in New York and Massachusetts.

The leader of this project has already prepared the initial draft of a proposed magazine article summarizing the results to date.

Trickling Filter Data

Trickling Filter Materials.—Trickling filters with slag, Florida gravel, lumber mill waste, and Florida Brooksville limestone are being tested. Analytical data are kept for each filter to determine the permanence and relative merits of these materials, and to determine also the permissible loading rates in Florida. The results and conclusions to date on two of the materials (gravel and

Brooksville limestone) were recently summarized by the project leader as follows:

- (a). The warm Florida climate allows higher BOD loading limits in trickling filters than permitted in the standards developed for northern climates. Preliminary indications are that depths of trickling filters can be reduced by about one-half in Florida to obtain BOD removals comparable to those normally obtained in northern climates.
- (b). Both of the Florida aggregates, gravel and Brooksville limestone, have proven satisfactory so far. As expected, the gravel readily passed the soundness test. From visual observations, the Brooksville limestone has shown no deterioration after 11 months of use, but additional results of sodium or magnesium sulphate soundness tests, before and after use of the aggregate, are desired before reaching a conclusion as to its permanence.

Incidentally, this project is the one for which our auxiliary treatment plant is being used. In general, it appears that the results already obtained (in less than one year) may prove to be enough, as regards savings to Florida taxpayers, to more than justify the cost of the sanitary research laboratory, including the plant itself.

There have been a few headaches, however. Sewage is not as easy as water to treat on a pilot plant scale. Clogging difficulties have been our major problem. Several of the units

have had to be redesigned to eliminate clogging in pipelines and elsewhere. This experience has demonstrated the need of using open channels wherever possible and of eliminating all restrictions that may tend to impede the free flow of sewage. Experience has also demonstrated the need of gravity drains at the bottoms of all tanks containing sewage.

Trickling Filter Loading Rates.—An investigation is being made of the performance of a 40-ft. diameter trickling filter at the campus sewage treatment plant, at rates of operation between the so-called "standard" rates and those commonly employed in "high-rate" filters. Samples are taken at various depths and the rate of oxidation of organic matter in the sewage is being studied as a depth function. The investigation is expected to furnish the data now missing between standard and high rates, to the end of developing a mathematical relationship between loadings and filter performances. So far the filters have been dosed at 5.0 and 7.5 mgad rates. The project was closed down during the summer, due to the small population on the campus. It was resumed on October 1st, when the dosing rate was again set at 7.5 mgad. The rates will be increased in increments of 2.5 mgad every two months until a 20 mgad rate is reached.

Subsurface Sewage Disposal

Because of geological conditions and a high ground water table, the disposal of sewage by subsurface means is relatively difficult in many parts of Florida. The university receives frequent inquiries as to the proper standards to be used in the

This is the last half of a paper presented at the Second Annual Meeting of the Kentucky-Tennessee Industrial Wastes and Sewage Works Association, held August 23-25, 1948, at Chattanooga, Tennessee. The sanitary research facilities at the University of Florida were described in the September 1948 issue of this magazine. This article describes some of the research projects being carried on in the Engineering and Industrial Experiment Station by members of the Sanitary Engineering Division, University of Florida.

design of subsurface systems. A most interesting feature concerns the development of a simple empirical formula for measuring the "percolation coefficient" of any given soil. Up to a percolation rate of 1 inch in 30 minutes, results obtained from the formula are identical with those obtained from a curve believed to have been published first by, and copied widely from, the New York State Department of Health. Beyond the 30-minute rate, the formula gives values approaching more closely the actual observations by Ryon than the values obtained from the New York curves. The formula is:

$$C = (T + 6.24) \div 29$$

where T is the percolation rate in minutes per inch and C is the percolation coefficient or the number of square feet of bottom trench area required for each gallon of sewage applied daily to a tile field designed for a life expectancy of about twenty years. The percolation coefficient for soils in which seepage pits are located can either be computed by a separate formula or it can be taken as 75% of the value obtained from the above formula.

Disinfection of Sewage

A study is being made of disinfectants and an investigation is under way to determine the influence of different physical factors upon the speeds of bactericidal reactions and efficiencies of the various disinfectants to be used. Work has been accomplished in determining the death rates of one of the test organisms, and the technique of making the experiments has been about perfected.

Survey of Florida Surface Waters

A start has been made on an office survey of the surface water resources of the State, with special reference to the probable effects of present and future pollution resulting from the disposal of sewage and industrial wastes. The purpose of the survey is to assemble all available data under one cover. This will facilitate an appraisal of existing conditions and will either lead to conclusions as to the steps necessary to maintain our streams in reasonable condition or will serve to indicate the additional information that may be needed in order to arrive at such conclusions.

So far, the principal drainage areas of the State have been outlined and information has been recorded as to the sewerage and unsewered populations in the various drainage areas. Efforts are now being made to obtain data on waste-producing industries so that the pollutional load of the industrial wastes upon the



A view of the laboratory: John Kiker in center, Earle Phelps at his right (in white).

streams may be interpreted in terms of "population equivalents."

This work was undertaken in cooperation with the State Board of Health, and most of the information to date has been obtained from that source. The work is following a pattern established in other States, and we are encountering the same difficulties experienced by other States in obtaining the desired information on the amount of pollution introduced into the streams by industry.

Diatomaceous Earth Filters

This project was undertaken at the request of David B. Lee, Chief Sanitary Engineer of the State Board of Health. Its purpose is to determine the performance and efficiency of diatomaceous earth filters under various operating conditions, and to ascertain the relative merits of this kind of filter as compared to ordinary rapid sand pressure filters most commonly used at swimming pools.

Three new diatomaceous earth filters were recently placed in service at the University swimming pool. They comprise the first multi-unit installation of the kind in the State. The State Board of Health has been apprehensive about approving the general use of filters of this type but it encouraged the present installation with the understanding that the Civil Engineering Department of the University would cooperate in determining operating characteristics and weaknesses.

The principal conclusion drawn to date is that while the claims of some manufacturers of diatomite filters are extravagant, the filters are satisfactory for swimming pool installations and should be acceptable as a substitute for gravity or pressure sand filters in a recirculation system for a

pool. The major claim to which objection is raised is that unskilled operation is satisfactory. We have found that just as much skill and attention should be provided at a diatomaceous earth filter as at a rapid sand filter or at an ordinary pressure filter.

The efficiency of bacteria removal is low with the coarse grade of filter-aid we have been using (Celite 545). The filter effluent has remained clear and sparkling, however, and the application of chlorine to the recirculated water has been generally accompanied by negative results in tests for coliform and other organisms.

As indicated by Black and Spaulding in the November, 1944, issue of the Journal of the American Water Works Association, finer grades of diatomite are more effective than the coarser material in removing bacteria. While we plan to verify these results later, most of the data we have obtained to date have substantiated the results quoted by Black and Spaulding.

Personnel

Earle B. Phelps, Professor of Sanitary Science and Professor Emeritus (retired), Columbia University, is serving as consultant on all of the above projects. He is also the leader on the surface water project. George R. Grantham, Assistant Professor of Sanitary Engineering, is project leader on sand filtration and trickling filter loading rates. The writer is presently leader on subsurface disposal, disinfection and diatomaceous filters. Wilson T. Calaway, Assistant Professor of Sanitary Science, has assisted on two of the projects. Graduate Assistants on two others include Donald D. Gold and David E. Barry.

Here is a tool for the Water Department, with capabilities far beyond the mere thawing of pipes, and useful in many ways throughout the year.

A Pipe-Thawer With Year-Around Usefulness

F. J. PURDY

Welding Sales Engineer, New England District, Westinghouse Electric Corporation

FROZEN water pipes present, each winter, a serious threat to the normal routine of community life. When pipes freeze, fire protection is hampered, sanitation suffers, and the city administration comes under the cross-fire of public criticism. A nose-dive in the temperature brings calls of complaint to many city departments from customers in distress. One water department in Maine reported 275 calls to clear frozen pipes last winter. Fortunately that department was equipped with electric thawing devices so it was able to handle the calls promptly and care for all of them.

Cities and water companies located in the cold weather areas can save money through the use of electric pipe thawers. Such equipment will not only permit them to handle smoothly and quickly the distress calls that come with every cold spell, but, if properly selected, such equipment can be used throughout the entire year to perform countless useful functions.

The Equipment

The gasoline engine driven DC electric welder is a jack of all trades. When used as a pipe thawer, it can thaw pipe in all sizes from house services to large mains, faster and at less cost than by any other method. When used as a welder, it is useful on many kinds of construction and maintenance work and on those general utility jobs so necessary in the modern city. When used with a 3-kw auxiliary generator attachment, it furnishes "on-the-spot" power for such jobs as operating electric power tools, provides floodlights or spotlights for emergency work, and fills in where electric current is not available or is temporarily cut off.

Thawing Pipes by Electricity

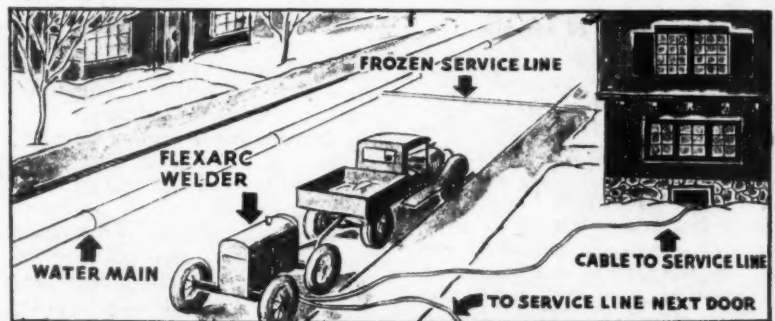
Pipe thawing by electricity is both fast and convenient. It does not require exposing the frozen section of pipe, nor is it necessary to apply heat or steam to melt the ice. Cables from the power unit are attached to

the frozen pipe at convenient locations on either side of the frozen area. One man can take the welder to the job, clear the line and be available for the next job in an hour or less. The welder may be mounted on its own running gear either 2-wheel or 4-wheel, so that it can be towed to the job with a light truck or automobile; or it may be skid-mounted, directly on a truck.

At the job, the operator merely runs leads to two locations on the pipe system, usually to the cellar inlet of adjacent houses which

used in making welded pipe connections, eliminating much electrolysis trouble and making pipe lines last longer. Some manufacturers supply an auxiliary power generator of 1 to 3 kw capacity, direct-connected to the welder. This auxiliary takes little space and adds only slightly to the price of the machine; but its uses are numerous, and are especially valuable in connection with emergency requirements.

For example, such equipment has been used for floodlighting, where a mobile, powerful light was required



Although the welder shown is not the latest model, this picture shows the simple procedure used in thawing pipes with welding equipment.

bracket the frozen section, and clamp the cable ends to the pipes. After evaluating the size and kind of metal pipe, he adjusts a single-control dial, starts the generator—and the rest is automatic. There is no need to disconnect pipes, dig up frozen ground, injure shrubbery or cut into streets. In about 15 minutes for a half-inch pipe to about an hour for a 6-inch pipe, the ice is loosened enough to let the water flow. There is no danger to electrical equipment in the house, to the pipes or to personnel.

Using the Welder on Other Jobs

Although many users have found that the pipe-thawing applicability alone will make the welder a good investment, there are many other money-saving uses to which it can be put throughout the year. It can be

quickly. Repair work at bridge sites and highway washouts are other examples of its use. With strong spotlights, this auxiliary power source can be used for rescue work, fire-fighting, law enforcement, and other functions of civil government.

Other types of "on-the-spot" power requirements that can be usefully served by an auxiliary generator include: Traffic safety lights, temporarily out of service due to power failure; power for hospital service; and the operation of power tools.

These manifold uses make such a welder valuable to other public works agencies as well as to the water department. For that reason, a joint purchase with street, sewer or other public works units, where water department needs do not demand its full-time use, may be desirable.

Water Works Data from Lewiston, Idaho

For the fiscal year 1947-48, 89% of the water pumped in Lewiston, Ida., was sold through meters, 5% was used by the municipality, and 6% was unaccounted for. Total pumpage for the year amounted to 107,211,880 cu. ft.

The average cost of installing water mains was as follows: Hand excavation, 35.4¢ per ft.; machine excavation, 18.5¢ per ft.; laying pipe, 58.3¢ per ft.; backfilling by hand, 14.2¢ per ft.; and backfilling by machine, 4.05¢ per ft. Pipe costs varied with the size of pipe, from 33¢ per ft. for 2-inch, \$1.26 for 4-inch, \$1.58 for 6-inch to \$2.24 for 8-inch.

These data are from the excellent report of the city of Lewiston, Idaho, W. P. Hughes, City Engineer.

Good Results From DDT Spraying

At a cost of only \$700, which was contributed by residents of the community, Center, Colo., put on an effective insect control campaign last season. A supply of DDT in powdered form was purchased, and a contract made with a local flying service for applying DDT to the town and over the dump. The first application was made rather early in the summer; a second about one month later; and the third and final during the middle part of September. According to George S. Browne, town clerk, there were no flies and very few other insects.

A New Type Warning Sign

During the winter months, highways in certain sections of New Mexico may become slippery, due to ice conditions caused by the highway being on a north slope or by being in shadow most of the day.

Patrol foremen of the Maintenance Division have been under instructions to place along such stretches of pavement, a warning sign when icy conditions exist. This was never very satisfactory, due to the fact that when a patrol foreman found one of these stretches it was usually necessary to travel back to his headquarters and pick up the necessary signs. When the icy condition disappeared, the sign was usually removed by the foreman or his crew by throwing it in the borrow ditch, and that was the end of the sign.

To solve this situation, the Sign Division of the New Mexico Highway Department designed a sign that would stay in place and yet not give unnecessary warnings. The sections of road that are subject to this icy condition were spotted and a sign post was installed. On this post an innocent looking triangle is mounted; in itself it means nothing to anyone. When this triangle is opened by the State Police or a patrol foreman, a Scotchlite surfaced sign is disclosed which shouts the warning ICY. When the condition subsides the warning disappears merely by closing the triangle with the one bolt provided for that purpose.

Radio Communication for Water Department Trucks

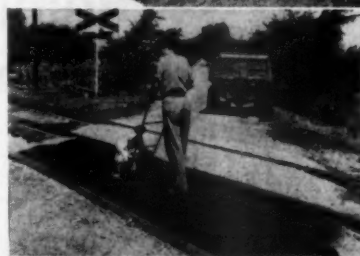
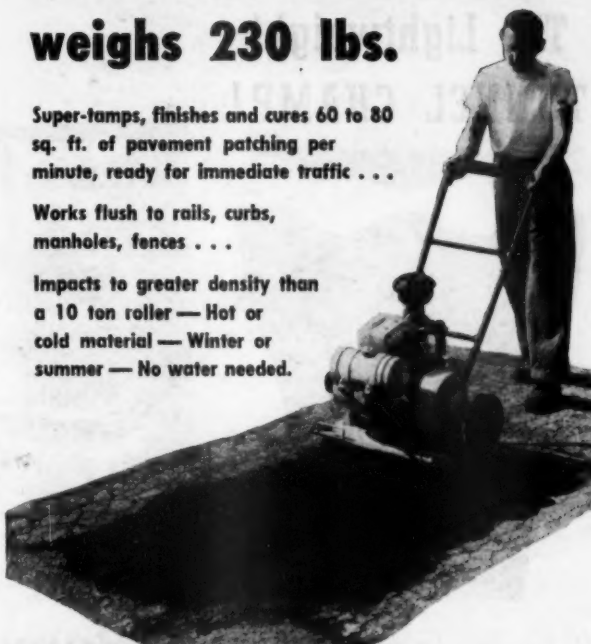
Shreveport, La., recently installed FM radio communications in 36 police cars and fire trucks, but also equipped four trucks of the city Water Department with this 2-way communication system. The units were manufactured by Federal Radio & Telephone.

A 10-TON ROLLER that weighs 230 lbs.

Super-tamps, finishes and cures 60 to 80 sq. ft. of pavement patching per minute, ready for immediate traffic . . .

Works flush to rails, curbs, manholes, fences . . .

Impacts to greater density than a 10 ton roller — Hot or cold material — Winter or summer — No water needed.



Heated Plate Strikes up to 2000 Blows per Minute — Over 700 Lbs. Impact in Each Blow: Puts patches down to stay, seals close places tight, ends water seepage in old "hazard spots".



Winter or Summer, Any Material: Engine exhaust heats impactor plate. No sticking; cures as it finishes. Pavement can be used immediately—no traffic hazard or congestion. Handles any hot or cold mix or dry concrete base.



Does Work Roller Can't Do: Finishes right up to car tracks, manholes, curbs, walls and fences. Completes small work (pavement repair, new drives, floors, etc.) in the time it takes to get a roller to the job. On big work, it finishes where the roller could not reach.

Big Savings in Cost: Low first cost, no transportation cost (carry in mix truck or any automobile). One laborer operates it. Averages only 2 gallons of gas per day. Built for years of service.

Solves Your Winter Patching Problems. Write us for Bulletin 25-8 and name of distributor who will gladly arrange a demonstration. Wayer Impactor Sales Co., 12 N. Third St., Columbus 15, Ohio.

WAYER IMPACTOR

for Highway Depts., Municipalities, Counties, Townships, Utilities, Contractors, Railroads

When writing, we will appreciate your mentioning PUBLIC WORKS

Meet The Lightweight TUNNEL CHAMP!

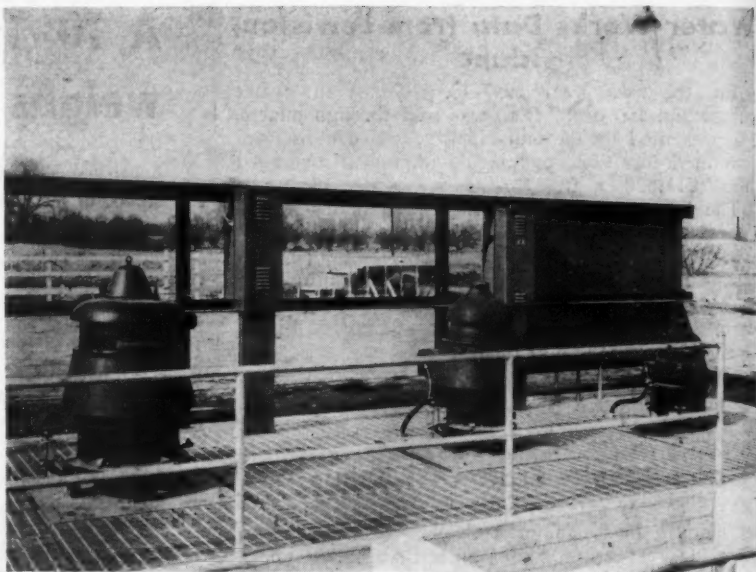


On a pound-for-pound basis ARMCO Tunnel Liner Plates are in a class by themselves. They save you money and speed the job.

These sturdy plates are designed for utmost strength with the least possible weight. One unskilled workman can carry, hold and bolt into place an ARMCO Liner Section. Only a structural wrench is needed. Labor costs are low and the job goes fast. Less bulk also means less excavation, and storage requirements are smaller. With ARMCO Plates you buy no excess metal, and this keeps job costs down.

Consider tunneling that next job with the aid of ARMCO Tunnel Liner Plates. You'll find it the simplest, most inexpensive way you ever saw to install conduits, sewers and similar structures. The hazards and inconvenience of open trenches are avoided and business above ground goes on as usual. Write for prices and complete information on your specific needs. Armco Drainage & Metal Products, Inc., 1965 Curtis Street, Middletown, Ohio.

ARMCO
TUNNEL LINER PLATES



The central pumping station, with three weatherproof units, left to right 75-hp., 60-hp., and 20-hp.

Pumping Station Solves Storm Drainage Problem

LOCATED at the south end of the San Joaquin Valley of California, Bakersfield has had a serious storm drainage problem. This resulted from the fact that a flat area about a mile square in the northwest portion of the city was about 3 ft. below the level of the Kern River, which forms a portion of the city boundary. There is no natural drainage for this area, and storm runoff from the streets and the surrounding area flooded the district, causing serious property damage.

It was calculated that, with a rainfall of 0.20 in. per hour, the area would have a run-off of 40 second-feet or 18,000 gpm. A system of 42-in. concrete pipes was installed to collect the water and carry it westward out of the city to a central pumping station. Here a concrete basin 30 ft. long, 20 ft. wide and 22 feet deep is provided. Three Fairbanks-Morse propeller-type pumps lift the water from the basin and discharge it into a canal which runs out into the farming area. Thus the troublesome city water becomes available for farm irrigation.

In designing the pumping station, Bakersfield wanted an arrangement of equipment that could handle the heaviest probable rains, yet would function efficiently and economically in disposing of lesser quantities of

water. Simple and trouble-free operation and control were also important factors to be considered.

The solution was a flexible combination of three motor-driven pumps of varying capacities. The largest unit, a 20" Fairbanks-Morse propeller pump, is driven at 870 rpm by a 75-hp. Fairbanks-Morse electric motor. This unit can handle 11,000 gpm. A second 20" pump of the same type is driven by a 60-hp. F-M motor and delivers 10,000 gpm. The third unit is a 12" F-M propeller pump driven by a 20-hp., 1,760-rpm F-M motor and capable of handling 2,800 gpm.

With all three pumps in operation, the station capacity is 24,300 gpm, which is ample for any anticipated demand. When lighter rains require drainage but do not require the full capacity of the station, any one or two of the units can be used. The motor switches permit remote control.

The excavation, concrete work, installation of pumps and electrical wiring for the central pumping station cost about \$40,000. This figure, added to the expenditure for the 42" piping network, brought the cost of the entire system to about \$200,000.

J. Holfelder is City Engineer, C. A. James, director of Public Works and Carl Thornton, City Manager of Bakersfield.

Job

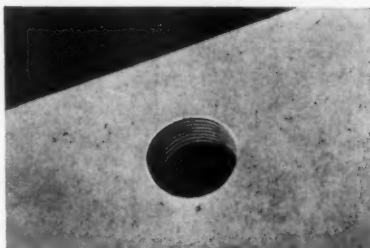
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Engineering Facts about Johns-Manville TRANSITE PRESSURE PIPE *Tapping for Service Connections*

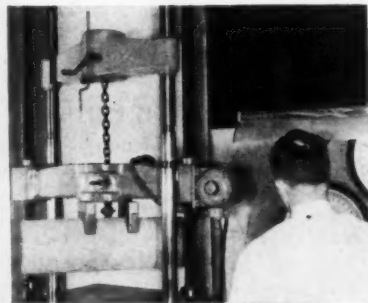
One of the many practical features of Transite* Pressure Pipe is the ease with which it may be tapped for service connections. Proof of this is evident in the hundreds of thousands of corporation stops which, over the years, have been inserted in Transite water mains. Year after year, these installations continue to serve their communities with efficiency and economy.



As this photograph shows, Transite Pipe takes clean, sharp threads. Strong and firm, these provide perfect seating for the threads of the corporation stop, assuring a watertight service connection.

developed and are available from leading manufacturers. Field experience shows that these special drills and taps remain sharp after prolonged use and are more economical than standard tools.

As is true with any tapped connection, maximum strength is obtained by engaging the greatest possible number of threads of the corporation



Laboratory tests demonstrate the strength of service connections made in Transite Pressure Pipe. In a recent series of such tests made on 8" Class 150 pipe, it required an average force of 4360 pounds to pull a 1/4" corporation stop from the pipe.

lubricant such as graphite and oil on the tap and the threads of the stop is recommended.

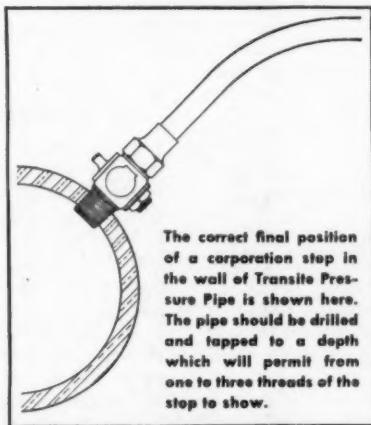
Taps may be made with either Corporation Stop threads or Iron Pipe threads. While the standard combined drills and taps may be used, special alloy ones have been



Transite Pressure Pipe is readily tapped with standard tapping equipment. Here the combination drill and tap is about to be inserted in the tapping machine.

Transite Pipe can be tapped wet or dry; standard tapping machines are used. The special asbestos-cement composition which gives Transite its toughness and durability also provides excellent threading properties. The threads are sharp, clean and strong. Service connections are tight and lasting.

To facilitate tapping and insertion of the corporation stop, the use of a



The correct final position of a corporation stop in the wall of Transite Pressure Pipe is shown here. The pipe should be drilled and tapped to a depth which will permit from one to three threads of the stop to show.

stop in the pipe wall. With Transite Pipe, this means that after the pipe wall has been properly drilled and tapped and the corporation stop fully inserted, from one to three threads of the stop will show.

Additional engineering data relating to service connections will appear in a future advertisement in this series. For further information, address Johns-Manville, Box 290, New York 16, N. Y.

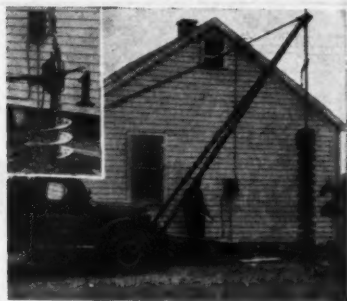
*Reg. U. S. Pat. Off.



City-County

PUBLIC WORKS

Engineering Data



How to sink a shallow well quickly.

Sinking Shallow Wells Quickly

Temporary or permanent wells can be drilled at the rate of 30 ft. per hour in dirt with the drilling outfit above, right. The bore diameter is up to 16 ins., and the drill is designed to pull out the dirt, leaving a clean hole into which a casing or pipe can be inserted. The outfit can be mounted on any standard truck.

Besides drilling for water, these Ka-Mo drills can be used for test holes; for pilot holes for wooden, cast or poured concrete piling; for setting posts; and for similar purposes. Also, they can be used for boring horizontal or sloping holes for pipes, drains or conduits. Drills are available in diameters up to 16 ins., and several drills can be joined for sinking the deeper holes.

Bid Prices on Road Construction

The following bids were received Sept. 23 for building the Echo Lake Highway, Arapaho National Forest, Colorado: Clearing and grubbing, 36 acres, estimate \$500 per acre, low bid \$500 per acre. Unclassified excavation, 218,000 cu. yds., estimate \$1.00, low bid \$1.00, with six other bidders ranging from \$1 to \$1.37 per yd. Unclassified excavation for structures, 1,200 cu. yds., three bids at \$4.00 per yd., four bids at \$5.00 per yd. Overhaul (1,000-ft. free haul), 160,000 sta. yds., six bids 3¢ and one bid 4¢. Sheepfoot or tamping roller, 1,500 hours, low bid \$2.50 per hour, other bids \$3 to \$8. Total estimated cost was \$308,558.40, not including engineering and contingencies. Low bid was \$300,039.10; next low bid \$316,437.50; high bid \$391,348.50.

Ferric Sulphate Used for Sludge Filtration

The Minneapolis-St. Paul Sanitary District has used ferric chloride for the conditioning of sludge prior to vacuum filtration for the past nine years. In June, 1947, it became necessary to change to a new coagulant because of inability to obtain the needed ferric chloride. Ferric sulphate in the form of Ferri-Floc was adopted and was used successfully during the final seven months of the year.

The important factors of solution concentration, point of addition of chemicals to sludge, and the methods of mixing them into the sludge had been well standardized with ferric chloride in the course of nine years of experience. These had to be worked out for ferric sulphate. Naturally, experimental and

development work was necessary. For the seven months of the year when ferric sulphate was used, the average dosage was 1.52% of ferric sulphate expressed in terms of ferric chloride. However, with increased experience, steady improvement in utilization was made and during the last two months of the year, the dosage of ferric sulphate expressed in terms of ferric chloride averaged 1.02%. Lime use rose from 2.53% with ferric chloride to 2.96% with ferric sulphate during the final two months.

During the early days of the usage of ferric sulphate, filter cloth life also decreased, but during the two final months of the year increased to 472 hours, as compared to 501 hours in 1946, 339 hours in 1945, and 474 hours in 1944.

These data are from the 1947 report of the Minneapolis-St. Paul Sanitary District of which Kerwin L. Mick is Chief Engineer and Superintendent.

120 Cu. Yds. of Earth Per Hour

An International T-9 crawler with a Hough shovel bulldozer keeps five 4-yard trucks busy making two-mile hauls to a fill near Lincoln, Nebraska. The trucks are loaded and make the round trip from this borrow pit to the fill in approximately 10 minutes, each truck averaging six loads per hour. Earth moved per hour totals 120 yards. Three shovel loads are required to fill each truck. In addition to loading, the tractor-shovel unit breaks up the compacted earth between loading operations.

Painting Swimming Pools

Indoor pools are usually tiled and require no painting. Outdoor pools constructed of light-colored concrete should probably not be painted. If the pool surfaces are of dark concrete, painting is probably necessary. The most satisfactory colors appear to be white or light blue. Aluminum paint appears fairly dark under water and should not be used as a pool paint.

Three types of paint have been used at pools: Waterproof enamel paints, rubber base; cement-water paint, enamel with water-resisting varnish.

The best paint for unpainted concrete pools is one having a chlorinated-rubber base. Properly applied, rubber paint results in a durable, fairly smooth, attractive surface which protects the concrete, facilitates cleaning, and promotes freedom from algae trouble. Most paints of this type will not bond with other type paint previously applied; it is usually necessary to remove the old paint by sand-blasting.

Cement-water paint is the cheapest but cannot be expected to last more than one season, and the resulting surface is rough, aggravating algae problems and making suction cleaning difficult.

Enamel paint with water-resisting varnish is not considered satisfactory as it is not very durable. Blistering and peeling difficulties are reported. From "Swimming Pool Operation," Circular No. 125 of the Illinois Dept. of Public Health.

Easy Method of Determining Altitudes

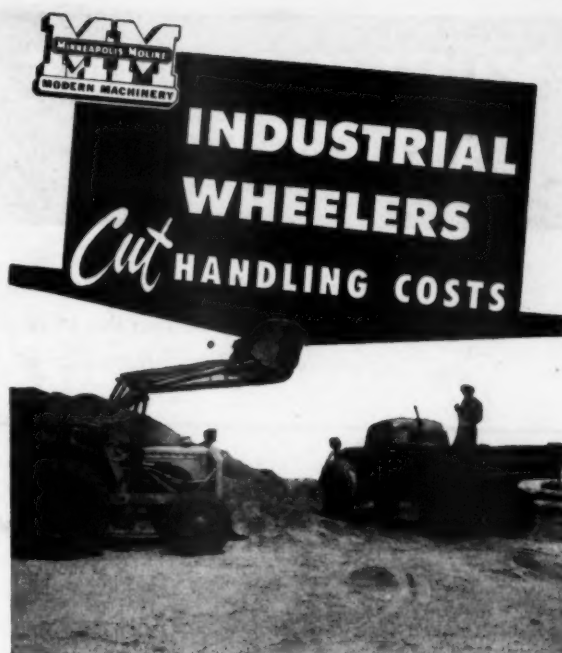
Elevations can be determined quickly with a special altimeter to an accuracy of about 1 in 1000, especially when using a matched pair of meters, with one located at a point of known elevation; or the differential elevation between two points can be determined similarly by using two meters. It is possible to measure up to 2,000 feet differential, and the scale can be read to the nearest foot. Time required is generally about one-tenth that required for angle or spirit leveling. This procedure can be used for control surveys for aerial mapping, for highway location, and on many water and sewerage jobs.

How the Marines Work Over Rats

The rodent control officer at the Marine Corps Air Station at Cherry Point, N. C., attaches a long section of hose to the exhaust pipe of one of the DDT-fogging jeeps, which is equipped with exhaust-generator equipment. The end of the hose is shoved into the rodent burrow and the fogging equipment turned on. The exhaust contains DDT-in-oil fog, mixed with carbon monoxide and other combustion products from the jeep engine. It is reported that this treatment forces the rodents from their burrows, which are then securely tamped. The DDT solution will also kill the various parasites on the rats and in the burrows.

Bedbugs Resistant to DDT

Indications are multiplying that certain insects are either acquiring some degree of tolerance to DDT, or genetically distinct strains are being developed which possess this tolerance. The Navy reports several instances where bedbugs were noted after DDT spraying. At first, this was believed to be due to incomplete or inadequate spraying, but tests were undertaken which showed that some bedbugs would survive for as much as two or three weeks after exposure to DDT. However, these resistant strains are by no means completely unaffected by DDT. The life expectancy of the bugs is markedly shortened. Also, the bugs are somewhat susceptible to the oily solvent of DDT/kerosene spray. Not only should attempts be made to kill as many of the bugs as possible by contact with the spray solution, but a heavier rate of application of the DDT should be used. In the past, considerable emphasis has often been placed on the effectiveness of exceedingly small dosages of DDT. It is better to use a dose perhaps twice as large as the minimum. Where application has been careful and thorough, and bedbugs or other insects remain active, another careful application should be made. If this also fails to kill all of the insects, write to the Professor of Entomology, at your state university, and give him the data. More research in this field is needed, as well as more precise long-term observation of the effects of DDT.



MM
MINNEAPOLIS-MOLINE
MODERN MACHINERY

INDUSTRIAL WHEELERS

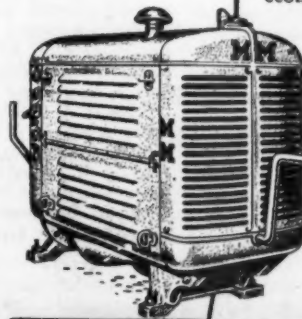
Cut HANDLING COSTS

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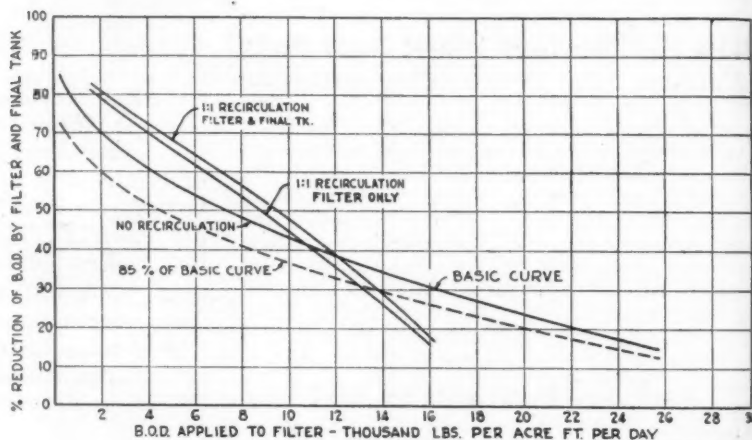
This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

The Sewerage Digest

Designing High-Rate Filters

In general usage, a low or standard rate trickling filter is one receiving loads of 500 to 600 lb. of applied B.O.D. per acre-foot per day; a high-rate filter is one receiving over 1,000 lb. When the load is 10,000 lb. or more it is sometimes called a roughing filter. High-rate filter plants may consist of high-rate trickling filters operating ahead of low rate filters; or single-stage high-rate filters without recirculation; or the same with recirculation; or high-rate filters in two stages, with or without recirculation. Long-time, large-scale operating experience is not yet sufficient to indicate which of these is to be preferred in a given case. However, taking operating data obtained at eight plants, the author has prepared a diagram from which to decide the size of filter, with or without recirculation, necessary to secure any desired reduction of B.O.D. (See illustration). In this, the basic curve indicates the operating results without recirculation (believed to be conservative). The efficiency with recirculation is computed directly from the basic curve, assuming that the operation or behavior of the treatment processes is not changed by the recirculation as regards the extent of treatment accomplished. It having been determined what BOD load to design the filtration plant for (raw sewage less removal by preliminary sedimentation) and what percentage it is necessary to remove, reference to the diagram indicates how high a load (in pounds per acre-foot per day) can be applied; and this divided into the total estimated load shows the area of filter of the assumed depth that will be necessary.

The author believes that high-rate trickling filters offer an extended range of sewage treatment in their applicability to the treatment of very strong sewage and to local conditions where the highest degree of treatment is not



BOD reduction by high rate filters and final tanks.

needed. But operating data need further study and design procedures need further development to arrive at the best over-all economy and the most desirable operating routine. Bases of design should therefore be conservative and the plant facilities should permit reasonably flexible operation.

Samuel A. Greeley—"Considerations and Procedures in the Design of High-Rate Trickling Filters," *Sewage Works Journal*, September.

Oxygen Balance Of a Swamp Stream

It is generally accepted that maintenance of 5.0 ppm of dissolved oxygen in a stream is necessary for healthy environmental conditions for fish life and 4.0 ppm for maintenance of other desirable sanitary conditions. In the author's opinion these figures do not apply where nature has provided sources of high organic loading and the native aquatic life has become adjusted to lower dissolved oxygen levels. Further, when ad-

ditional organic loading is added by man, the rate of assimilation in these swamp streams differs from that of other types of waters. The Blackwater river, flowing through southeastern Virginia is low in mineral content and highly colored from its drainage of cypress swamps. It contains 75 to 100 ppm of total solids, about equally divided between fixed and organic. Dissolved oxygen saturation averages approximately 40% from March to October, rising to 70 or 80% during the winter. The oxygen input from reaeration during the summer appears to be less than the oxygen losses resulting from the natural BOD. The flow varies from a maximum of 1400 to 2400 c.f.s. during February and March to a minimum of 10 to 70 cfs in September. In spite of these conditions, the stream affords good fishing for bass, bream and perch. The only pollution entering the stream is the sewage of 5,000 population and waste from a 300-ton-per-day kraft pulp and paper

mill. From the author's observations, the maintenance of 2.5 ppm average dissolved oxygen, with a minimum of 2.0 ppm, would provide satisfactory conditions for both native fish life and the esthetic characteristics of this river, and this should be recognized by the authorities in regulating pollution which they permit to be discharged into it.

Stuart C. Crawford—"Oxygen Balance Studies of a Typical Swamp Stream"; *Sewage Works Journal*, September.

Concentrating White Water Sludges

The suspended, dissolved and total solids of white water from paper and paper board manufacture are about 1.5 times those of strong sewage. The suspended solids consist of fibre, filler material and considerable quantities of impurities. The sludge volume obtained by plain settling averages 7.7% of the original waste volume. In the studies made by the authors it was found that: (1) In general, white water sludge will concentrate at relatively low rates; the effectiveness of gravity settling depends principally on the sludge nature and initial concentration; (2) Subsidence in the hindered settling phase is more rapid with sludges of lower initial concentration, than with sludges of initially higher concentration, indicating the value of frequent sludge removal; (3) Greater subsidence velocities are achieved at higher sludge temperatures, and in order to preserve high sludge temperatures, frequent sludge removals are preferable in cases where the white water is treated by sedimentation; (4) The buoyant effect of gases evolving impedes settling through attachment of gas bubbles to sludge particles; and (5) The volume of sludge can be readily decreased in 3-6 hours to 25-40 per cent of the original by gravity settling or flotation, depending upon the initial concentration; further compaction is primarily a function of time and temperature.

Willem Rudolfs and A. J. Palladino—"Concentration of White Water Sludges"; *Water & Sewage Works*, September.

Planning Digestion Tanks

Heated digesters can be used for populations as small as 5,000, and can be placed relatively near residences. One tank is practicable (if funds are limited) but two or more are desirable. The tank may be rectangular or circular, and with or without stirring mechanism. Stirring mechanism may be slow or high speed, and be located within the digester or recirculating pumps may be located outside of it. Arrangement so that two tanks can be operated either parallel or in series is desirable. Both floating and fixed covers give satisfaction. Heating methods in use include hot-water coils around digester peripheries, removable coils hung near the center of the digester, or coils enclosed in the di-

gesters walls; submerged gas burners; live steam heating of raw sludge; adding live steam or hot water to the tank contents; and heat exchange units outside the digesters. The majority of existing tanks use one of the first two methods; the others are recent devices still in the trial stage.

Le Roy W. Van Kleeck—"Digestion of Sewage Solids"; *Water & Sewage Works*, July.

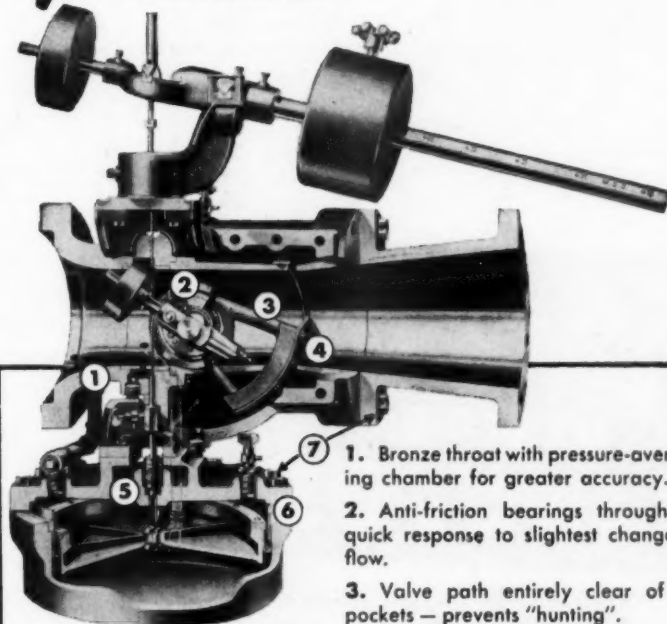
Pumping Sewage Sludge

At Magden, England, 5% partially digested sludge has been pumped through 7 miles of 12" pipe for 10 yr.

without measurable increase in friction head. Chicago for 14 yr. has been pumping 1.18% mixture of activated and primary sludge through 17 mi. of 14" pipe with a reduction of *C* from 141 to 93 during that period. Cleveland, O., in 1938 began pumping sludge through 13 mi. of 12" pipe. For two years sludge with 2% solids was pumped without difficulty, but when it was then concentrated to 3% the pumping pressure rose rapidly because of deposits of grit, grease, hair, etc. in the pipe, these being greatest where the pressure was greatest. Cleaning the line raised the *C* from 80 to 130, but cleaning was necessary again in less than

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2 yr. This cleaning cost \$1,250 plus labor and kept the pipe line out of service for almost a week. By building a junction chamber at each end of the line through which a "go-devil" is introduced and withdrawn, the entire 71,000 ft. can now be cleaned in 8 hr. as a routine operation, and for four years pumping sludge with 3.8% dry solids has proceeded successfully.

John J. Wirts—"Sludge Pumping Through Long Force Mains;" *Water and Sewage Works*, October.

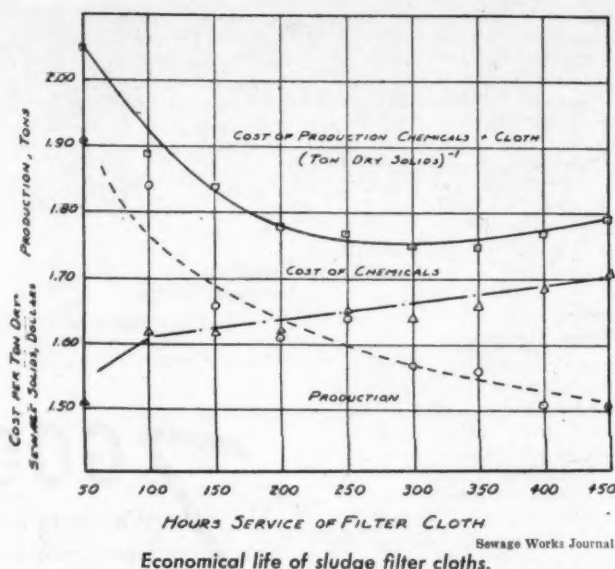
Use of Plant Effluent

Fort Wayne, Ind., uses plant effluent instead of the formerly used city water for meter flushing, grease skimming and chlorinator feed water. It is found equally as satisfactory—more so in winter when it has a temperature of 50° compared to the 32° of the city water. This saves \$2400 a year for water.

Ralph A. Hoot—"Plant Effluent Use at Fort Wayne;" *Sewage Works Journal*, September.

Tenafly, N. J. uses chlorinated plant effluent as a source of water for the chlorinators. This reduces the paid water consumption by 50 to 75%, but there has been some difficulty due to grease and small solid particles clogging the chlorinator strainers.

J. Kenneth Adams—"Operating Experiences at Tenafly, N. J.;" *Sewage Works Journal*, September.



Economical life of sludge filter cloths.

Vacuum Sludge Filtration in Detroit

In the Detroit filtration plant about 25% of the sludge from the sedimentation tanks is subjected to short-period digestion; this and the undigested sludge are dewatered on 8 vacuum filters. On the basis of chemical cost, fil-

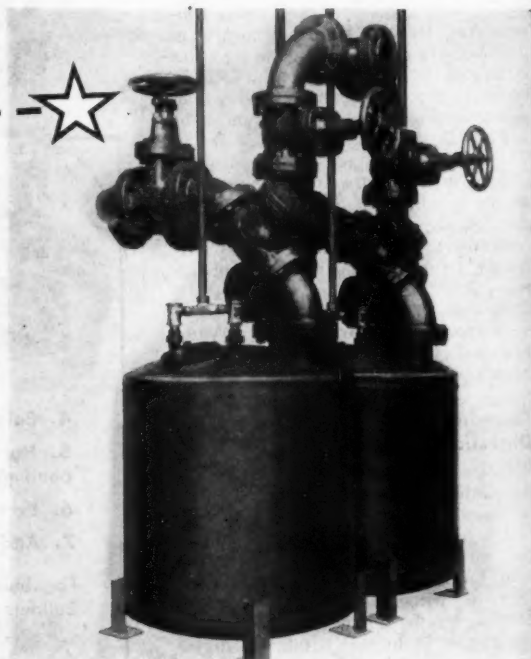
tering raw sludge is cheapest, mixed sludge next, digested sludge is most expensive even if allowing for the fact that the amount is reduced 21% by digestion. Passing digested sludge through the sedimentation tanks make it act substantially the same as raw sludge. In winter, however, it is drawn

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directly to the filter to take advantage of its heat in heating the other cold sludge. Sludge is digested in sufficient quantity to furnish gas for the necessary heat.

The filter cloths used are 10 oz. Canton flannel, the nap of which causes it to "blind" less quickly. The plastic cloths tried blinded more quickly and showed lower production. Comparison of filter cloths is made on the basis of the economical life, considering the investment in cloth and wire, chemical dosage necessary, and decrease in production with use. Present runs are 300 to 340 hr. (See cut).

Fred H. Burley—"Vacuum Sludge Filtration Practices at the Detroit Sewage Treatment Plant;" *Sewage Works Journal*, September.

Commercial Utilization Of Waste Digester Gas

Burning digester gas seems a waste of available energy, and it has been suggested that the surplus gas might be sold to the local gas utility. The authors explain why this is impracticable, some of the reasons being as follows: Digester gas does not average more than 650 Btu heat content, but most contracts or franchises require more than 950, and the work and equipment involved in enriching or concentrating the digester gas to provide necessary heat content would be considerable. The specific gravity, moisture content and other characteristics vary widely and the changes might cause trouble with gas appliance control equipment. The carbon dioxide and hydrogen sulfide would require removal. Pressures carried in utility gas mains are considerably greater than those in the gas collection systems of sewage works.

The most simple and profitable solution is to burn the gas in a boiler installation, provided conveyance of the gas to such installation is physically and economically feasible.

John J. Wirts—"Commercial Utilization of Waste Digester Gas;" *Sewage Works Journal*, September.

Experiments on Thermophilic Digestion

The optimum temperature range for mesophilic digestion is about 30° C, for thermophilic is about 50° C. At about 60° retardation sets in. Between 30° and 50° is a range concerning which the authors conducted a series of investigations, holding the sludge to various intermediate temperatures; which warranted the following conclusions:

If sludge that is digesting at 50° C is cooled, the rate of digestion falls and gasification stops completely while the sludge is at 20°. After sludge is returned from suboptimal to optimal temperature, no lasting effect on the subsequent digestion is obtained.

Mixtures made with sludge acclimated at 40° do not digest or produce gas when incubated at 20° C, but digest readily when incubated at 50°. Temporary changes to 20° result in temporary stoppage of gas production,

but it is resumed immediately when the temperature returns to 40°.

Similar organisms appear to be responsible for digestion at both 40° and 50°, but the rate of their activity is less at 40°. They differ from the mesophilic organisms, since they cause no digestion at 20°. On the basis of comparison of the existing systems of classification of thermophilic bacteria, bacteria responsible for the digestion of sewage sludge seem to fit the characterization of facultative thermophilic bacteria better than that of obligate thermophiles.

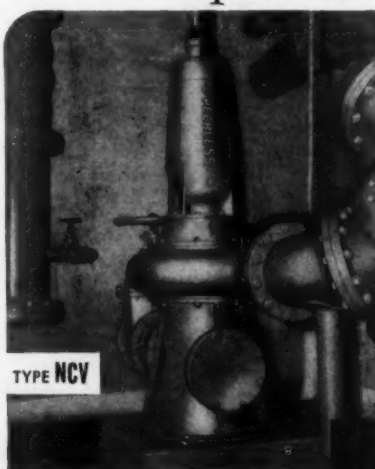
H. Heukelekian and A. J. Kaplovsky—"Effect of Change of Temperature on

Thermophilic Digestion;" *Sewage Works Journal*, September.

Sludge Lagooning

Sludge lagoons have been used for undigested sludge by Chicago, Indianapolis, Houston, Rahway and Syracuse, N. Y.; and for digested sludge by Akron, O., Baltimore, Batavia, N. Y., Chicago, Dallas, Fitchburg, Mass., Pontiac, Mich., Rochester, N. Y., Rockford, Ill., Trenton, N. J. and Wichita, Kans. Lagoons are particularly useful for emergency storage or disposal of sludge. Sometimes they are worked until filled completely with sludge, but frequently

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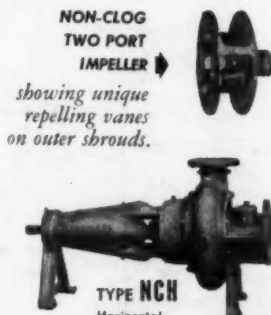
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the drained and digested material is removed at intervals and used to fill low-lying areas in the neighborhood or hauled away by farmers for agricultural use. At some plants they have been in use for over 20 yr. When receiving raw solids they may give rise to unpleasant odors particularly in the late spring when the sludge temperature begins to rise above 60° F. and the sludge held through the winter starts to decompose. When receiving digested solids a lagoon becomes a storage basin and can be loaded over a period of years then dried out and cleaned. Much greater capacity per capita is required for lagoons than for digestion tanks, the greatest for excess activated sludge. In the Southwest where the monthly temperatures average above 60° F, lagooning should prove adaptable and efficient, with proper design for mixing and seeding and withdrawal of supernatant.

Report of Committee on Sewage Disposal, A. P. H. A.—"Sludge Lagoons;" *Sewage Works Journal*, September.

Stream Pollution Legislation and Control

In a symposium on industrial wastes, referring to legislation, Prof. Bloodgood said:

(1) Federal legislation can serve the citizens of the United States to the greatest extent by coordinating the ac-

tivities of state stream pollution control units.

(2) State legislation should authorize a board of control having broad powers so that the board can establish the necessary rules and regulations, which must change with the development of the times.

(3) Industry has no objection to well-written, reasonable laws on stream pollution control.

(4) Development of suitable and improved industrial wastes disposal methods can be brought about by legislation providing for the necessary studies.

In the same symposium F. W. Mohlman describes a 12-yr. study made of industrial wastes of more than 300 plants in Chicago, from which he drew the conclusions that "there are good prospects of salvage in numerous industries and that many former wastes are now recovered and sold at a profit. Even though no profit is realized the procedures discussed are those which recover salable materials and thus reduce the cost of final treatment. . . . No illusions should be held as to the possibilities of profitable recovery. A newcomer envisions great prospects for industry by rather obvious methods of recovery, but by the time all costs are included the process usually works out at a loss. The loss, however, is not so great as the cost of final disposal of the materials by sewage treatment methods, and hence is preferable.

"Many recoveries are profitable, such as grease and tannage from packing-house wastes, wool grease from wool scouring, grains and yeast from breweries, feed and possibly yeast from distilleries, feed from corn products, possibly alcohol or yeast from sulfite liquors, phenol from coke by-products, sulfur from chemical wastes, copper from pickling wastes, oil from refineries, and whey from cheese plants. All these recoveries are in use. However, manufacturers in time come to regard salvage as part of factory operations, and one-time losses such as gluten, feed, grease, yeast, and other products are no longer classed as by-products or wastes, but as primary products of plant operation and profits. This is not a discouraging attitude, but makes the future prospect for profitable recoveries more bleak, although still an attractive field for the conservationist."

Prof. Don E. Bloodgood and F. W. Mohlman—"Industrial Wastes: A Symposium," *Proceedings, Am. Soc. of Civil Engineers*, September.

Specifications For Filter Media

The British Standards Institution has been engaged for four years in an effort to prepare standard specifications for filtering medium, meantime carrying out rather lengthy tests on different classes of materials, including coke, coal, clinker, gravel, crushed stone, and

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slag. The specifications, which have recently been published, do not attempt to recommend which of these materials or what sizes should be used for a specific case, but deals only with those properties which are desirable in any type of material—uniformity of size, shape, freedom from dust or impurities, and durability. As to size, it is the "nominal maximum size" that is specified. For a nominal maximum of 1", all must pass a 1½" sieve, 85 to 100% must pass 1", not more than 45% the ¾" and not more than 7% the ½". Shape must be generally cubical or spherical. For durability, crushing and abrasion tests were considered but rejected, and the A.S.C.E. "sodium

sulphate soundness test" was adopted, with some modifications that make the requirements rather less stringent.

B. A. Southgate—"A British Standard Specification for Media for Percolating Filters"; *The Surveyor*, Sept. 10.

Treating Trade Wastes

At Germiston, Transvaal, Africa, a scheme has been evolved for charging manufacturers for receiving their trade wastes in the public sewers and treating them. It is based on the general principle of basing such charge on the work that has to be done, taking account of both nature and volume of discharge.

The "load unit" for any plant effluent is obtained by multiplying the 4-hr. O.A. figure by the volume. The total charge is made up of the cost of pumping the plant effluent, the cost of purifying it, and that of disposing of the sludge. From the treatment plant records are calculated the cost per load unit of aerobic purification of the city's sewage and the cost of anaerobic digestion per pound of dry volatile material. A sampling station is to be located at each plant and record kept of the flow and 24 samples a month be taken and analyzed.

Commenting on this scheme, a prominent English engineer, John Hurley, says that the cost of obtaining and analyzing these samples for a small plant with a comparatively clear effluent might be more than the charges to be collected; that oxygen absorption is not always a true measure of the cost and difficulty involved in treating a trade effluent—some that do not absorb any oxygen can cause considerable trouble, and A.O. loads due respectively to sulphides, carbohydrates and proteins would not need identical filter capacity; and in many cases the content of volatile solid matter in a sludge would not be a true criterion of the cost of treating it, especially for trade wastes.

John Hurley—"Accepting Trade Effluents into Sewers"; *The Surveyor*, Sept. 3.

Automatic Plant Operation

The Ephrata, Wash., treatment plant is practically automatic in action. The only daily manual operation required is the turning of a plug valve during the sludge pumping cycle. The sewage passes through a comminutor, is pumped to a clarifier, and the effluent flows to leaching galleries. The scum is removed through an overflow trough by the automatic opening of a valve in the bottom of the trough, which is performed periodically by the scraper mechanism. The raw sewage pump is operated by electrodes in the wet well, which at the same time turn the chlorine supply on and off. A time clock operates the sludge scraping mechanism, and another operates the pump lifting sludge to the digester and the sludge recirculation pump, which also is operated by thermostat to maintain the temperature in the digester. The plant effluent is disposed of through leaching galleries in a gravelly tract that is otherwise useless, there being no water course to receive it.

L. L. Sphar—"Ephrata Sewage Treatment Plant Develops New Digester Techniques"; *American City*, October.

Liquid Sludge As Fertilizer

Marion, Ind. in 1940 put into operation a plant which included vacuum filtering, but after two years the filtering was discontinued and disposal of the liquid sludge has replaced it. Digested sludge from the bottom of the secondary digester is pumped, to a 1500-gal. or a 1000-gal. tank truck and hauled

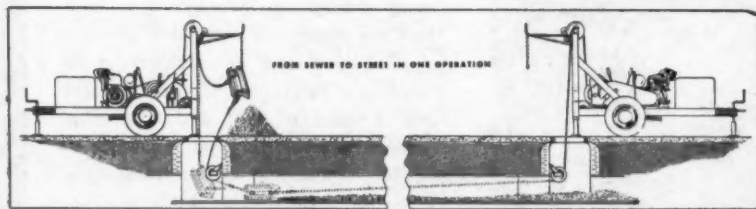
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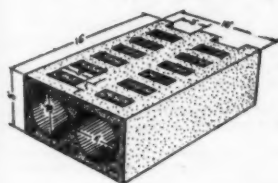
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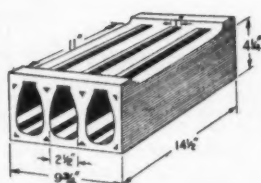
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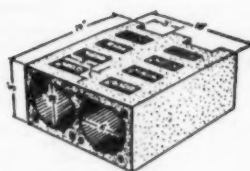
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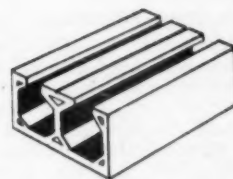
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to a farm, where it is spread at the rate of about 7500 gal. per acre. The charge is 20¢ per 1,000 gal. per mile of distance from the plant. During wet weather when the fields are muddy, the sludge (which has to be removed every day because of the inadequate capacity of the digesters) is hauled to lagoons, lands for which are rented at \$50 to \$100 a year. The sludge in 1947 averaged 2.84% dry solids. A 12-acre dairy farm last year received 90,000 gal. of sludge containing 520 lb. of total nitrogen and 505 lb. of phosphate, having a market value of \$101; for which the charge was \$63. No deliveries are made more than 5 mi. away or to those raising root-type crops. The net cost of this disposal is \$1.63 per dry ton as compared to \$1.83 for chemicals for filtration in 1941 and 1942.

David Backmeyer—"Disposal of Liquid Digested Sludge at Marion, Ind.;" *Water and Sewage Works*, October.

Alternating Two-Stage Filtration

Marysville, O., treats its sewage in a plant containing four trickling filters 90 ft. in diameter which are so connected that they can be used in either series or parallel. The sewage treated is domestic sewage from 4,300 persons and waste from a milk processing plant. To learn whether best results can be obtained by operating all four filters in parallel, or two as primary and two as secondary, or the latter with alternating use as primary and secondary, the plant was operated for a time by each of these methods, with the following results: Single stage: Applied, 0.407 lb. of BOD per cu. yd.; removed, 0.300; efficiency, 73.7%.

Two-stage, continuous: BOD applied to first stage, 0.984 lb.; to second stage, 0.464 lb. BOD removal by first stage 0.523 lb., by second stage, 0.268 lb. Total efficiency 79.4%.

Two-stage alternating: BOD applied to first stage 0.818; to second stage, 0.208. BOD removal by first stage, 0.610 lb., by second stage, 0.078 lb. Total efficiency, 81.6%. This procedure gave somewhat better control of ponding and a decrease in psychoda flies.

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Effects of Low Temperature on Trickling Filter Operation. By Earl H. Arnold, Jr., San. Engr., No. Dakota Dept. of Health. October, Pp. 49-50.

Disposal of Pharmaceutical Wastes. October, Pp. 53-54.

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National Round-Up of Sewage Works Planning. By Harry Heuser, Field Representative, FWA. October, Pp. 511-516.

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Industry and Government Cooperate to Clear New York Frontier Waters. By Earl Devendorf, Asst. Dir. State Health Dept. October, Pp. 525-526.

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Mechanism of Activated Sludge Process. By W. E. Abbott, Chemist, Sew. Disposal Dept., Nottingham, England. September, Pp. 841-845.

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Treatment and Disposal of Waste Soluble Oils. By E. F. Eldridge and R. W. Purdy, Eng. Experiment Sta., Michigan State College. September, Pp. 849-856.

A Plating Waste Disposal Problem. By Almon L. Fales, Consultant, Metcalf & Eddy. September, Pp. 857-860.

Industrial Waste Pollution Abatement Program for Buffalo, N. Y. By George E. Symons, George F. Fynn and Howard Brown, Consultant, Chief Chemist and Research Chemist, Buffalo Sewer Authority. September, Pp. 861-871.

A Pilot Plant for Treatment of Phenol Still (Coke) Wastes. By Newell L. Nussbaumer, of Nussbaumer & Clarke, Consulting Engrs. September, Pp. 872-875.

Oxygen Balance Studies of a Typical Swamp Stream. By Stuart C. Crawford, Research Chemist, Camp Mfg. Co. September, Pp. 876-880.

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Plant Effluent Use at Fort Wayne. By Ralph A. Hoot, Supt. Sew. Treatment Plant. September, Pp. 908-909.

Operating Experiences at Tenaflay, N. J. By J. Kenneth Adams, Supt. Sewage Treatment Plant. September, Pp. 909-911.

Interesting Extracts From Operation Reports. September, Pp. 912-917.

Use of Chloroben for Odor Control. By Frank S. Taylor, Filtration Engineer, Oklahoma City Water Dept. September, Pp. 917-920.

Sewer Maintenance at Wichita, Kans. By George J. Fisher, Supt. of Sewers. September, Pp. 920-922.

Commercial Utilization of Waste Digester Gas. By John J. Wirts, Asst. Constr. Eng., Cleveland Dept. of Utilities. September, Pp. 923-924.

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Sludge Pumping Through Long Force Mains. By John J. Wirts, Asst. to Com'r, Utilities Engineering, Cleveland, O. October, Pp. 345-351.

Disposal of Liquid Digested Sludge at Marion, Ind. By David Backmeyer, Supt. Water & Sewage Works. October, Pp. 353-356.

Digestion of Sewage Solids: Operation of Heated Digesters. By Leroy W. Van Kleeck, San. Engr., Conn. Dept. of Health, October, Pp. 357-362.

Cleaning Air Diffuser Plates by Sand-blasting. By John R. Longley, Dist. Engr., Greater Peoria San. Dist. October, Pp. 363-365.

"Tenaflay Soil Food" From Sludge

Tenaflay, N. J., dries its dewatered sludge with a Raymond flash dryer, and sells the dried sludge with a guaranteed nitrogen content of 5% and total phosphoric acid content of 3%. Revenue from this has increased every year, amounting to \$4,673 in 1947, at \$30 a ton. About \$500 worth of fuel oil and \$200 for paper bags should be charged against this revenue, leaving nearly \$4,000 net income. No charge for labor or chemicals is included because these would cost approximately the same for other types of sludge disposal.

The Highway and Airport Digest

Consolidating Granular Materials

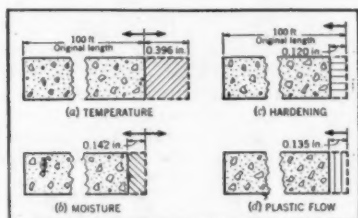
Michigan State Highway Dept. has been conducting extensive studies of consolidation of granular materials in fills. Laboratory tests showed that detrimental settlement will occur with any material placed without compactive effort. Sand or well graded bank-run gravel will give the greatest density with the least compactive effort. Moisture content has no appreciable effect on densities of compaction by vibration, but it has great effect on those produced by tamping or inundation. Tamping may be used on any granular material, maximum densities being obtained if tamped in layers of 4" to 6" or less.

Hand tamping and mechanical tamping are effective but slow and expensive. The effect of penetrating vibrators is confined to a very small area. Surface type vibrators such as the modified paving tube and self-propelled platform vibrators proved to be the most efficient. The cost of placing backfill with vibrating equipment is less than when placed in accordance with the requirements of the current specifications of the Michigan State Highway Dept.

Roy L. Greenman — "Michigan Studies Backfill Consolidation"; *Eng. News-Record*, Sept. 16.

Prestressed Concrete Runways

What is said to be the first prestressed concrete runway in the world has been built at Orly Field, near Paris, France. A stretch 1400 ft. long and 200 ft. wide was inserted in a runway of ordinary concrete for comparison. The prestressed concrete is 6½" thick, the ordinary concrete is 24" thick. The prestressed pavement is made up of one-meter square precast blocks, the concrete mix being 1:2.2:2.6, with 3½ gal. of water per bag of cement. The foundation, with a bearing strength of 100 psi, is covered with 2" of fine sand. The pavement is laid with joints at 45° with the axis of the runway, dividing it into 6 right-angle isosceles triangles with 400-ft. hypotenuses. A heavy concrete abutment is set at each end of the strip. The prestressing cables are set cross-wise of the pavement, and when stressed, the diagonal joints cause a longitudinal stress as well as a transverse one; the joints having ball bearings so that they slide readily. The concrete is stressed to 4,750 psi. Some of the claims made are that, because of the thinness of the slab, stresses due to differences of top and bottom temperatures are low; articulating the strip practically eliminates warping due to temperature changes; cracking, if it occurs, is really an advantage as increases



Principal causes of volume changes in an unloaded concrete slab.

ing the flexibility, and the cracks are closed by the cable tension as soon as the load is removed.

"Prestressed Concrete for Runways"; *Eng. News-Record*, Sept. 16.

Expansion Joints in Concrete Pavements

Stresses in a concrete pavement caused by traffic are of less importance to the designing of joints than are those stresses which are caused by volume changes that take place within the concrete during and after the hardening period. Such changes are due to temperature changes, hardening contraction, variation in moisture content, and plastic deformation resulting from sustained stress. Probably the maximum stress that would be caused by any combination of these would be 920 lb. per sq. in.; and pavement concrete usually has a compressive strength of more than 4,000 lb. per sq. in. From these considerations and results of experiments, the author concludes that little or no expansion space need be provided if

- (1) The pavement is constructed of materials that have normal expansion characteristics;
- (2) The pavement is constructed during those periods of the year when the temperatures are well above freezing;
- (3) The pavement is divided into relatively short panels by satisfactory contraction joints so spaced as to prevent the formation of intermediate cracks; and
- (4) The contraction joints are properly maintained to prevent the infiltration of incompressible material.

Thus, with infiltration controlled by the installation and maintenance of properly spaced dummy contraction joints, it appears that concrete pavements do not need expansion joints. Only in concrete pavement built during cold weather does there seem to be any reason for using expansion joints, and even then they are needed only at long spacing, perhaps from 600 ft. to 800 ft. In fact, concrete pavement built without excess expansion space may be

expected to have increased structural capacity and to give better performance than pavement having expansion joints at short intervals. In addition it is simpler and less expensive to construct, easier to maintain, and has better riding qualities. It can be stated that the current trend in jointing practices on modern American highways is in the directions indicated.

A. A. Anderson — "Expansion Joint Practice in Highway Construction"; *Proceedings, Am. Soc. of Civil Engineers*, September.

Methods of Ice Control

Eight replies to a questionnaire sent to state and country engineers are given. They are from New Hampshire, Minnesota, Wisconsin, Indiana, Ohio and Michigan. Treated abrasives cost more than obtaining bare pavements in New Hampshire, but are used generally in Wisconsin, Indiana, and Ohio. In some Michigan counties sodium chloride is considered cheaper and more effective for fighting ice; but in general treated abrasives are used. One thinks it necessary to treat all of a given class of danger points, or none; first all stops, then all hills, then all curves. These and railroad crossings are generally considered most important. One selects for first treatment school-bus and milk routes. One prefers central stockpiling of abrasives with mechanical loaders to small stockpiles at short intervals — "A truck will travel many miles in the time it takes to load it by hand." All but one use mechanical spreaders as cheaper, faster and giving more uniform spreading. Said one: "If snow is to be handled properly, roadside mowing, brushing and drainage must all be taken care of."

"How Big an Ice Control Budget?" — *Better Roads*, September.

Rubber For Roads

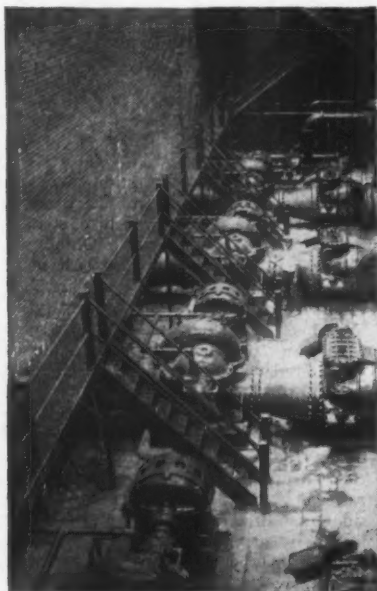
In Holland a number of roads have been laid using asphalt with the addition of 5 to 10% of rubber powder. It is claimed that the rubber improves penetration, resistance to impact, softening point and absence of flow; that the road is more durable, the foundation better protected, maintenance cheaper, and anti-skid properties better. About 11½% rubber-asphalt mixture was used with 76% sand and 12½% filler. "The Use of Rubber on Roads"; *South African Municipal Magazine*, August.

Reducing Cost of Hot-Mix Paving

A contractor in Texas gives a number of practical suggestions to both contractors and engineers, from which

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a few are selected below. Hot-mix work done during December to March (in Texas) costs as much as 50% more than during the other months. Instead of putting a limit to the number of working days, put a date limit for completion of a job. Moving an asphalt plant is expensive; awarding large jobs or adjacent ones to one contractor would enable him to bid lower. Use local aggregate more generally. For leveling up an old road, use a fine-graded mix and let traffic compact it before the surface course is started. Do not require a job to be cleaned up to a degree that will not be maintained later by the highway department.

W. M. Jagoe—"A Contractor Makes Suggestions for Reducing Hot-Mix Paving Costs"; *Roads and Streets*, September.

Radio Equipment In Onondaga County, N. Y.

The Onondaga Co. Highway Dept. in October 1947 installed a radio system which cost \$16,004 for station equipment, and \$2,501 for mobile equipment and other expenses. The total cost of operating the system has averaged \$80.62 a month. The county feels that it has paid for itself in less than a year. It completely covers the entire county—over 1,000 sq. mi. One day last winter during a heavy snow storm, the heavy service truck was sent by radio to seven stalled plow units in succession and got six of them back into service at once. During the summer, work gangs held up by storm were sent to other locations where they could work instead of idling. The county has 40 mobile receivers and 15 mobile two-way units.

Ray B. Traver—"Radio—Will It Pay"; *Better Roads*, September.

Mile Posts on Arizona Highways

The Arizona Highway Dept. has practically completed placing 3803 mileposts on all federal-aid and other state highways in that state. The advantages obtained are:

1. Simplified control of maintenance cost-keeping on each mile of highway.
2. Easier reference to the location of needed road repairs. No longer is there any doubt about the location of reported bad road conditions.
3. Quicker location of proposed road improvement projects.
4. Better control of traffic-counter placement and traffic-census data.
5. Identification of construction projects by route number and from milepost number to milepost number, instead of by project number and local termini.

The miles are numbered along each route beginning at the western and southern boundaries of the state. The measuring device used for locating the posts was a wheel attached to the left side of an automobile geared to two bitometer instruments as a check, an additional check being obtained by an odometer used by the location crew. An error of only 2 ft. per mile was possible on level tangents, and the greatest er-

ror was 25 ft. under the poorest conditions.

The posts are 6 ft. long, triangular in cross-section with 5" x 6" x 6" faces. They were cast in steel forms with prison labor at a cost of \$11 for material and installing. White portland cement was used, with indented numbers painted black. Holes for the posts were dug with a post hole auger where the soil was favorable, but about 15% of the holes required drilling and blasting.

"Mileposts Mark Arizona Highways"; *Better Roads*, September.

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Mileposts Mark Arizona Highways. September, Pp. 21-22, 33.

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Up-to-date Methods of Making Coated Macadam. By A. J. Lyddon. Sept., 29, Pp. 25-29.

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Sand Loader Speeds Up Snow Removal. By A. H. McCaffrey, City Engr. October, Pp. 31.

Stage Construction of Bituminous Concrete Highways. By Alan N. Buck, Supt. of Highways, Macon Co., Ill. October, Pp. 34, 36.

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Pre-stressed Concrete Highway Bridge. October, Pp. 58.

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Bituminous Paver Mixes and Spreads Emulsion Base. September, Pp. 53-54.

Four-Level Super "Crossroads" Embodies Novel Structural Features. September, Pp. 58-64.

Reducing Hot-Mix Paving Costs. By W. M. Jagoe, Pres. Public Construction Co. September, Pp. 72-73.

How Big the Contract Section? September, Pp. 91-93.

Truck Mixers Go Rural. September, Pp. 94-97.

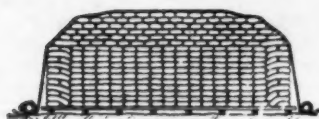
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The Surveyor (England)

Design of Concrete Pavements. Sept. 10, Pp. 471-472.
Unidirectional Lighting of Double Carriageways and One-Way Roads. By J. S. Smyth. Sept. 17, Pp. 479-481.
Street Lighting in the Vicinity of Aerodromes. By S. English and J. G. Holmes. Sept. 17, Pp. 486-487.

Traffic Quarterly

Some Operational Aspects of State-Wide Highway Planning. By D. Grant Mickle, Director, Traffic Eng. Div., Automotive Safety Foundation. October, Pp. 317-329.
Analyzing a Complicated Interchange (Tonnetle Circle, Jersey City). By Chas. L. Austin and Henry Fagin. October, Pp. 400-414.

Virginia Road Condition Survey

The Virginia State Highway Department last February initiated a survey of the effect of the deep freezes of last winter on the highway system. Engineers evaluated the performance of every road at a time when conditions were at their worst and when differences in performance were most apparent. Results of the survey have just been made available, although the data are still incomplete. The performance of each road was classified as excellent, good, fair, poor, or very poor. In addition, facts were gathered pertaining to soil conditions, road design, type of material, and climate.

The figures demonstrate that performance under winter conditions is closely related to soil type and road design.

On the coastal plain, where soils are ideal for road construction, only 16 percent of the primary routes were rated "poor" or "very poor." In sandstone and shale areas—poor soil for highway work—as many as 73 percent of the primary roads were listed in these categories. In certain soil areas, it was found that various types of construction materials hold up better than others. This information will be of value in new construction procedures.

Design and the degree of improvement were important factors in the performance under freeze-and-thaw conditions. Higher type roads generally were "excellent" or "good" in performance rating while roads of low-type construction were in the poorer ratings. This was illustrated by a comparison of overall performance on the secondary and primary road systems—with construction on the primary system generally of a higher type than on the secondary system.

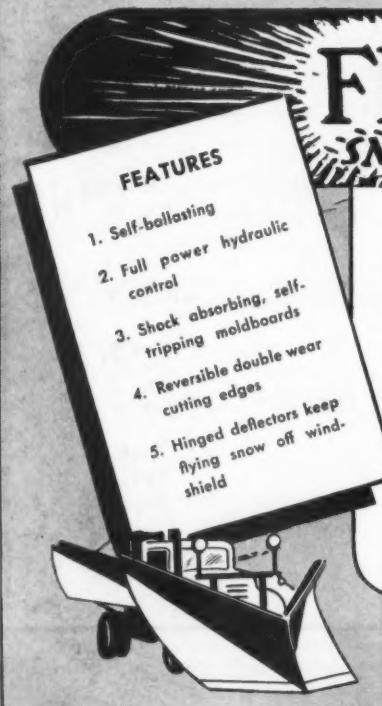
On the primary system, performance of 23.6 percent of all mileage was rated "excellent," compared with

7.6 percent on the secondary system. "Good" ratings applied on 34.0 percent of the primary roads, and 25.4 percent of the secondary. Other primary ratings were 23.2 percent "fair," 10.8 percent "poor," and 7.5 percent "very poor." Among other secondary roads, 29.2 percent were "fair," 17.2 percent "poor" and 20.4 percent "very poor."

Fluoride Treatment at Lewiston, Idaho

The Annual Report of W. P. Hughes, City Engineer, for the fiscal year ending June 30, 1948, says: Fluorides have been applied to the Lewiston water supply for a little over one year. The program has gone along smoothly with no serious trouble of any kind. Some difficulty was experienced in feeding it. The light grade of fluoride was purchased to start with and it was found, when damp weather came in the fall, that it would not feed satisfactorily. The dense material is much better to feed and gives no trouble.

Fluoride is added at the rate of 2.3 lb. per million gallons of water. During the year, 1633.7 lb. were added, the cost of which was \$2,292.09.



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Statistical Methods for the Control of Asphaltic Concrete

The use of statistical methods in the control of asphaltic concrete in France is exemplified by the results obtained from analyses of a 1.2-in. (3-cm.) hot-process asphaltic concrete carpet constructed in 1935 and not re-surfaced until 1947. The mix was produced in batches of 550 lb. (250 kg.). From a tabulated summary showing the deviation from specification requirements of the binder, filler, sand, and stone content for 18 samples, it is possible to determine for each constituent (a) the mean deviation, (b) the maximum deviation, and (c) the average quadratic deviation ("typical" or "standard" deviation). By utilizing in (c) deviations from specification requirements instead of from the mean an expression is obtained which takes into account both the mean and the maximum deviations, and enables the effectiveness of mixing to be assessed. Calculation of the mean, maximum, and quadratic deviations from the tabulated results shows that the mean deviation is small (except in the case of the filler) and the maximum deviation is of the order of 20 per cent, giving a measure of the order of accuracy to be expected in a non-continuous plant not modernized appreciably for about 20 years; while the average quadratic deviations are reasonably close. Since these results are comparable with those obtained on other sites over a period of 15 years, including results tabulated for a site in operation in 1947, the following conclusions may be drawn:—(1) As the surfacings have given satisfactory service, the deviations obtained may be used to fix permissible tolerances in the framing of specifications. (2) A high maximum deviation is less dangerous in a discontinuous than in a continuous mixing process. (3) The influence of the mixer on the quality of mixing can be assessed only if the materials used are homogeneous and conform to specification requirements. (4) If the composition of the materials is known to be uniform, the average quadratic deviation permits comparison of the performance of two different mixers. (5) If mixing is complete, a correlation exists between the sand and binder contents. The triangular granulometric diagram due to R. Feret is applied to investigating the cause of variation in the sand content of samples.—*Road Abstracts*, from A. Pincon: *Rev. gén. Routes*, 1947, 17 (191), 14-8.

New York Adopts New Garbage Loader

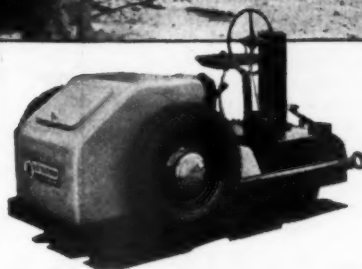
A new loading device which aids in packing garbage into the truck body and enables trucks to carry double their present loads has been adopted by New York City. The use of these loaders, which were designed by Ernest Miller of the Sanitation Department, will also permit reducing loading crews from four men to three. New York has approved the purchase of 62 of the new units.

Getting Rid of Weeds and Poison Ivy

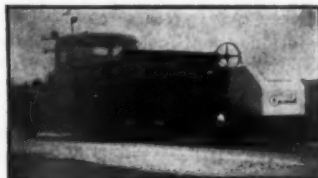
Weed-Spray Week-End was the term given to a community effort in Springfield, Pa., to eliminate weeds and poison ivy from the village parks, playgrounds and school yards. The American Chemical Paint Co. supplied Weedone, a 2,4-D product, which was applied by volunteers by means of sprays from a truck-mounted power pump and from knapsack sprayers. Results were excellent.

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The Water Works Digest

Output of Filter Beds

It is incorrect to assume that the capacity of a filter plant is equal to the "standard" rate of each clean filter multiplied by the number of installed units. To operate a plant continuously at a capacity based upon the total rating of the filters will require initial filter rates higher than the standard and relatively frequent washing. Tests at Baltimore showed that to maintain a plant rate of 4 mgd per unit required initial rates of 5.5 mgd if washed after 32 hr. of service, and a higher initial rate if the intervals between washing were longer. The "standard" rate for rapid sand filters has been established by usage at 2 gal. per sq. ft. per min. This is empirical, and a clean filter can be operated at 3 or 4 gal. per sq. ft., but the rate will decrease continuously with use. In the Baltimore test the rate, beginning at 2.7 gal., fell to 0.6 gal. in 56 hours of service.

Edward S. Hopkins—"Filter Plant Output Compared to 'Standard' Rating of Beds"; *Water Works Engineering*, September.

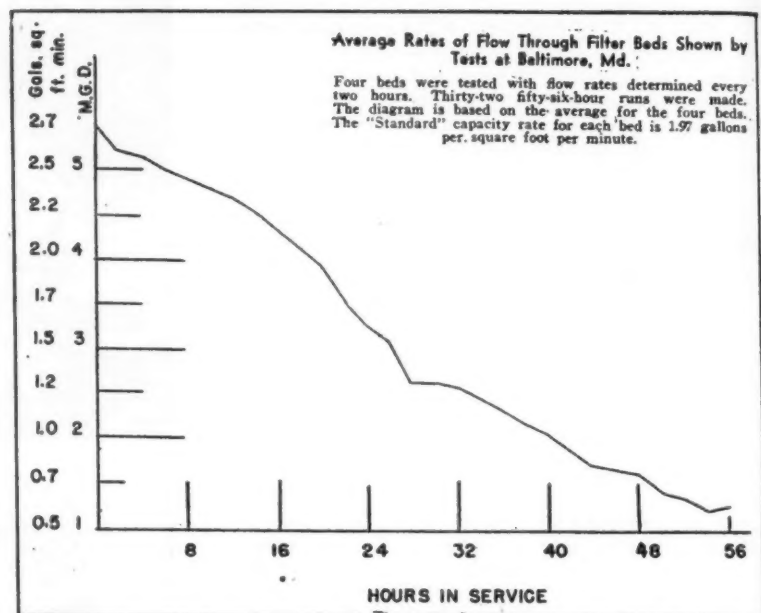
Taste-Producing Growths in Service Pipe

It is not difficult to remove from a distribution system the bacterial growths that produce H₂S and other odors, by use of chlorine in proper doses. If the work is done carefully and the pipe growths killed and flushed out gradually, little inconvenience to users need be caused and the deposits can be killed and removed in a year or two. But in some cases deposits in the consumer's service are not removed and continue to cause tastes and odors and other H₂S troubles. The bacterial slimes are found in hot water pipes and boilers as well as in cold water pipes. No remedy is suggested.

Carl Wilson—"Odor and Taste Control as Influenced by Consumers' Pipes"; *Water and Sewage Works*, October.

Algae and Fish Life in Reservoirs

In general, algae are most abundant in reservoirs with a large water shed, a large amount of shallow water, and a rich supply of organic material. Their growth is dependent chiefly upon the food supply, temperature and sunlight. Algae are eaten by small animal life but not to any extent by large fish. A reduction of sunlight reduces the photosynthetic activity of algae, causing them to use oxygen stored in the water; and if this continues too long, fish in the reservoir will die of oxygen starvation. This may be caused by such a thick growth of algae on the surface as to



Water Works Engineering

shut off sunlight from those below the surface. With a balance of algae and fish life, the growth of algae will be kept down. As small fish eat algae and large ones do not, the removal of large fish at intervals will aid in reducing the algae. But the resultant multiplication of small fish and their growth tend to restore the former conditions. "Man can never balance a large body of water so that he can definitely state that such and such will happen, because nature is forever changing."

Allan S. Kennedy—"The Algal Environment in Relation to Fish"; *New England Water Works Ass'n Journal*, September.

Bermuda's Water System

The islands of Bermuda are formed entirely of cemented coral sand which is quite porous. The principal source of domestic water is rain water from the roofs collected in underground tanks. With the growth of several-storied hotels for the tourists, increased population with small relative roof area rendered the supply insufficient, especially for bathing, flushing lawns and other uses other than drinking, and a new supply was obtained by laying 6" open-joint pipe in trenches in rock at the foot of a hill that forms the boundary of a marsh. This collects water from a lens of fresh water which floats on the salt percolating sea water. This proved inadequate and was supplemented by an 8" pipe line laid be-

neath the 6" and entering the concrete collecting well at invert elevation—1.75. Water from the 8" line has a higher total hardness and chloride content than that from the 6". All water is treated with lime and alum, sedimentation, filtration through gravity rapid sand filters, and chlorination. In 1944 this treatment reduced silicate from 19.5 to 2.6; magnesium from 87.3 to 51.9; sulfate from 151.4 to 109.8; chloride from 1195.6 to 980; and total hardness (CaCO₃) from 725 to 365. The charge for the water is \$2.08 per 1000 gal., less 10% to 50% discount if paid within 15 days.

Peter E. Mitchell—"Bermuda's Unique Water System"; *Water Works Eng.*, October.

Cleaning Service Pipes

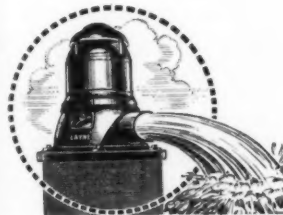
Where iron deposits clog service pipes they are commonly removed by means of a flexible cable. In several Iowa towns a procedure has been developed in which a small portable pump pumps chlorinated water back through the service into the main at rather high velocity. Generally 10 gpm for two or three minutes will clear a ½" service. One man with a pump and 100 ft. of pressure hose has cleaned 10 services a day, connecting the hose at the union provided for the meter.

M. K. Tenny—"Reverse Pumping Removes Iron Deposits From Service Pipes"; *Water Works Engineering*, October.



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Water Supply for Lafourche Parish

Lafourche Parish, La., is intersected for the 57 miles of its length by Lafourche Bayou, on which live about 20,000 of the 38,615 inhabitants of the parish. The water of the bayou is not fit to drink, no artesian water is obtainable, and the inhabitants rely on rainwater from roofs collected in wooden tanks. This occasionally fails, and then water is hauled from the water works of Thibodaux, the parish seat, which is filtered Mississippi river water. A water district has been formed and aims to supply water under pressure to the homes that line both sides of the bayou, obtaining it either from the Thibodaux water works or direct from the Mississippi about 12 miles away. Two 1,000 gpm pumps will deliver the water against a dynamic head of 210 ft. into a distribution system consisting of 147 miles of 14" to 2" cast-iron pipe, of which 51 miles will be laid along the north side of the bayou, 55½ miles along the south side and the remainder in adjacent areas; the two lines being connected across the bayou at a number of points. A pressure of 45 psi will be maintained with the aid of four elevated tanks and four booster stations operated by electric power with automatic controls. Fire protection will be provided by means of 401 fire hydrants located on pipe lines 6" or larger. The project is estimated to cost over \$4,000,000.

"Fifty-Seven-Mile-Long Bayou District Plans Water System"; *Water Works Engineering*, September.

Cleaning Slow Sand Filters

At West Hartford, Conn., water is filtered through twelve ½-acre and two ¼-acre slow sand filters. They contain 27" of sand on 12" of gravel. They are cleaned by harrowing at intervals of about 2 months, washed at intervals of 9 to 12 months, and entirely reconditioned once in 7 years. Harrowing is done by means of a small tractor drawing a spike-tooth harrow with 6 spikes, which takes about 1 hr. per bed. After five harrowings, a bed is washed, using a washing head consisting of a 5 ft. length of 2" pipe from which 30 hollow teeth project downward, 8", 10" and 15" teeth being used. A pump forces water downward through openings in the bottom of the teeth, stirring up and washing the sand; and the dirty water is sucked up by another pump and discharged outside. Four passes of this machine in each of two directions at right angles to each other are made in each washing, ten days being required for a ½-acre filter. After 7 years, each bed is reconditioned by removing all the sand down to the gravel, washing and returning it. In removing the sand, it is shoveled into 4 hydraulic ejectors which discharge it through 3" rubber hose into a pair of Nichols separators used in series, and is then returned to the bed through a 2" rubber hose. This takes 12 men and a foreman 37 days to clean a ½-acre bed.

Alexander J. Minkus—"Operation of the Slow Sand Filter Plant of the Metropolitan District, Hartford, Conn."; *New England Water Works Ass'n Journal*, September.

Relation Between Revenue and Expenditure

After analyzing the finances of water works departments of a number of cities the author found that there was a general approximation to a fixed ratio between the capital value of a plant and the revenue needed to operate the department adequately; and that for cities approaching a half million population this ratio is 8 to 10%, while 11% is needed for cities of 10,000 to 25,000 population. In using this ratio, the book value should be increased to that of present-day reproduction, for in most cities an increase in rates is necessary for adequate operation, expansion and safe financing. This analysis suggests that a revenue of approximately 10% of the capital is warranted, on the average; and if the revenue now is only 8%, then a 25% increase of rates is indicated.

Chas. R. Capen—"Water Works Revenue and Expenditure"; *Am. Water Works Ass'n Journal*, September.

Fire Hazards And Protection

Fire hazards have been increased by many recent developments in materials and processes. Fluorine has dropped in price from \$75 a pound to probably 25¢, is being used for a greatly increasing number of purposes, and is capable of producing flame temperatures that will cause steel, glass and asbestos to burn. Increasing uses of liquid oxygen, heat-treating of metals involving molten salts, perchloric acid, and use of insecticidal smokes and colloidal vapors for fumigation are additional hazards. Others are high-voltage electro-processing, higher temperatures in industrial ovens and dryers, use of liquefied petroleum gases as fuels.

Mathew M. Braidech—"Controlling Industrial Fire Hazards"; *A.W.W.A. Journal*, September.

Water is the most effective agent for extinguishing nearly every type of fire, if properly applied.

To provide for fire fighting by the occupants before the arrival of the fire department, pressure on the top floor of the building must be 20 to 25 psi. Few modern industrial buildings exceed four stories, for which another 20 psi should be added, and thus a total minimum pressure of 40 psi, should be available at ground level; 60 to 75 psi. will allow for losses in pressure during high consumption, and pressures up to 100 psi. have proved not to be objectionable.

The fire flow for ordinary fire department use is generally figured for a residual pressure of 10 psi. where only large hydrant outlets are used and 20 where small outlets are available. If a sprinkler system is provided, a residual pressure of not less than 15 lb. under

the roof and a flow of 250 to 500 gpm is satisfactory.

A. C. Hutson—"Flow Requirements for Fire Protection"; *A.W.W.A. Journal*, September.

Public Use of Reservoir Lands

Seven water works men took part in a panel discussion of this subject at the 1948 conference of the society. Some of the typical ideas advanced were as follows:

The public use of reservoir lands and waters could play a significant part in the public relations program of almost every water works system. But certain parts of the land should be excluded from public use, such as the areas around the intake and head works, and all reservoirs storing filtered or purified water. Permit fishing from boats but not from the shore line. Place fireplaces, tables and toilet facilities for picnickers in remote portions of the watershed. Richard E. Bonyun.

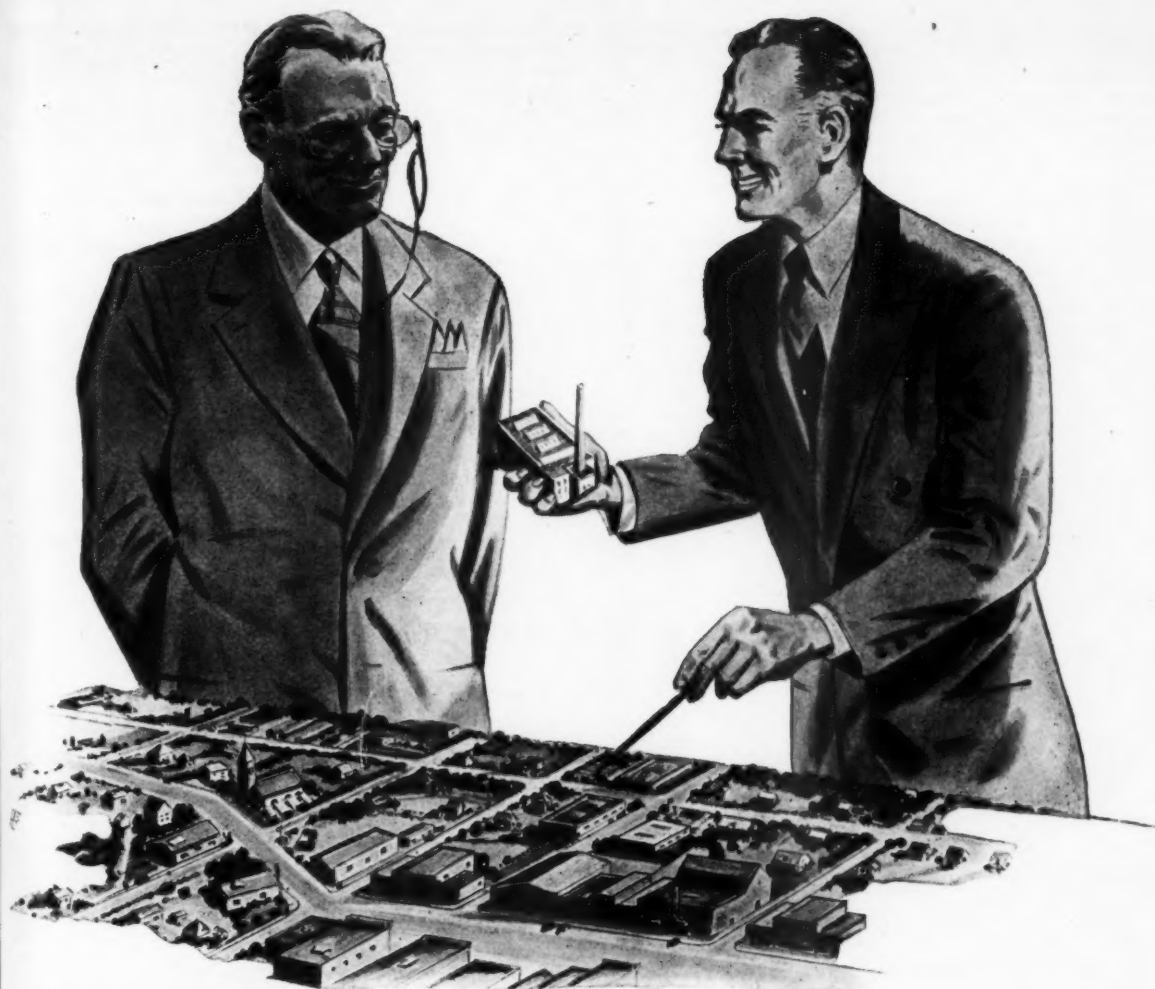
The slight potential pollution load brought about by recreational use can hardly be compared to the known heavy pollution load caused by sewage discharged to rivers in some sections of the country. The author feels that the safe quality of the water should be assured by treatment rather than by protection of the supply. Gerald E. Arnold.

The enforcement of regulations regarding fishing in reservoirs can be very troublesome and cost more than the income from any reasonable fees for fishing. If boating and fishing are allowed, swimming would be demanded. A very small percentage of the population would utilize the privileges that would threaten hazards to the entire community. The lakes should not be opened to the general public for any purpose. Eugene F. Dugger.

In constructing Lake Springfield (Ill.) the water dept. divided all of the land bordering on the main body of the lake into areas for homes and parks. Water mains and sewers, driveways, picnic tables, etc. were provided, and two bathing beaches built. The lake was stocked with several kinds of game fish. "The water department feels it has contributed much to the recreational life of the community and has improved its relation with the people in the surrounding area." S. T. Anderson.

The city of Baltimore has contracted with the League of Maryland Sportsmen to permit fishing in the Prettyboy Reservoir from boats owned by the league and rented to individuals, and supervised fishing from the banks. The league provided 50 boats in 1947. Bacterial tests of the water from the lake as it entered the filtration plants are made daily, and neither total counts nor coliform organisms have increased since fishing was allowed. An infinitesimal proportion of the city's population fish in this lake and the effect on public relations is negligible. Edward S. Hopkins.

Use of motor boats may interfere with fishing and produce an oil film on the water that may cause tastes and



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odors and be otherwise objectionable to everyone. Hunting at or over the water for water fowl or any other game should not be allowed. No one can hope to convince some people that the dead duck they saw at the dam would not be a source of danger to them or the water supply generally. Charles E. Moore.

As surface water supplies in the United States almost invariably require filtration or treatment of some kind prior to being distributed to the public, so great a degree of apprehension need not be felt toward the controlled use of watersheds by the public. The author is thoroughly in accord with the idea of making greater recreational, agricultural and silvacultural use of watersheds when this can be done under proper conditions without jeopardizing the safety of the water supply. Harry B. Shaw.

"Public Use of Reservoir Lands and Waters"; *A.W.W.A. Journal*, September.

Radioactivity Well Logging

Radioactivity well logging was first made commercially available in 1940. Used originally in oil-well surveying, it and electrical logging methods have been utilized in connection with ground-water supply development. Radioactivity logging apparatus permits surveying of cased as well as uncased bore holes. The gamma-ray curve provides log of well-wall strata when correlated

with known local lithology. Combinations of gamma-ray and neutron curves are available to provide evidence for interpretation and correlation with known local conditions with respect to relative permeability of well-wall strata and amount of contained fluids. Electrical logging apparatus permits surveying of uncased bore holes, providing curves of self-potential and resistivity, which can be correlated with known local lithology to provide log of well-wall strata and facts and evidence regarding relative porosity of permeable strata, character of contained liquids and relative hydrostatic heads in different producing zones.

The author describes the apparatus used and the theory and methods of interpreting the results.

John J. Baffa—"The Utilization of Electrical and Radioactivity Methods of Well Logging for Ground Water Supply Development"; *New England Water Works Ass'n Journal*, September.

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Foaming and Carry-over in Boilers. By R. W. Seniff, Engr. of Tests, Gulf, Mobile & Ohio R. R. September, Pp. 961-970.

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Water Plan of California Anticipates Statewide Development of Water Resources. By Edward Hyatt, State Engineer. October, Pp. 18-23.

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Filter Plant Operation at Cambridge, Mass. By Fred E. Smith, Chemist, Water Dept. Sept., Pp. 220-223.

Highlights of Private Water Company Operation. By Allen M. Symonds, Water Utilities Service Corp. Sept., Pp. 229-237.

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Operation of the Slow Sand Filter Plant of the Metropolitan District, Hartford, Conn. By Alexander J. Minkus, Sr., Asst. Engr., Water Bureau. Sept., Pp. 242-249.

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Improving Boise's Water Supply. By H. R. Vinson, Gen. Mgr. Boise Water Corp. October, Pp. 32-33.

Elevated Tank Reduces Pumping Costs and Improves Fire Protection. By X. D. Murden, Supt. Portsmouth, Va. Water Dept. October, Pp. 37.

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This is a new powder admixture, added to the salt to be applied to streets and highways in snow and ice control, which prevents corrosion of automobile fenders and other parts. Salt has been used most effectively and widely to make winter driving safe and its application for that purpose has become standard practice. The only objection to its use has been its corrosive effects on automobile fenders. This new chemical, called Banox, not only prevents such corrosion, but forms a protective film on the under side of the vehicle. It is a powder, and one pound is mixed with each 100 pounds of salt to be applied to the streets. Banox is colorless; odorless; harmless to the skin, eyes, clothing, plants or trees; and will not injure or discolor automobile finishes. It should fill a long-felt need by its ability to eliminate the complaints of highway and street users, permitting fullest advantage to be taken of the values of salt in making streets safe for travel. Write to *Calgon, Inc., Pittsburgh, Pa.*

Use coupon on page 67; write in No. 1-11

Trench Roller for Road Widening, Relocation and Repair

This roller gives compression per lineal inch equal to or exceeding that of most 10-ton rollers. The seat pivots around the steering post so that the operator is always facing in the direction of travel. Rolls either 16" or 20" wide are available. The short wheelbase of 80 ins. permits an unusually short turning radius. *Huber Manufacturing Co., Marion, Ohio.*

Use coupon on page 67; write in No. 2-11



Huber's trench roller gives 10-ton compression.



Vibro-Plus soil compactor.

95% Compaction in Two Passes

A sled-type vibratory soil compactor which weighs only 3100 pounds provides 95% compaction in 2 passes, to a depth of 4 ft., according to the manufacturer. Higher compaction can be obtained by more passes, or to a lower depth. At depth of 1½ ft. 98.9% compaction has been reported. The unit should be of great value to cities and counties in road and street work, driveways, airports, trench and backfill compaction, maintenance and small paving jobs. For data on results of tests, write *Vibro-Plus Corp., 243 West 55th St., New York 19, N. Y.*

Use coupon on page 67; write in No. 3-11

Economical for Small Crane Jobs

This crane has full hydraulic operation, eliminating many extra parts; it weighs 9375 pounds, without truck. It



Bucyrus-Erie H-3 hydrocrane.

has a clamshell bucket, ¾-yd. capacity; or it can be equipped with material handling, trash or snow, orange peel for cleaning catch-basins, grapple or

other buckets or devices. It is highly mobile and useful for many jobs. *Bucyrus-Erie Co., 7923 West Greenfield Ave., Milwaukee 14, Wisc.*

Use coupon on page 67; write in No. 4-11

Two Handy Small Tractors

Two new garden tractors, the Model D, with 1½ hp. Briggs & Stratton engine, and the F with a 4½ hp. Briggs & Stratton engine, have been announced by Waterbury Tool. Front end attachments suitable for both models include 30" sickle bar, 24" lawn mower, 30" snow plow, counterweight and power take-off, and these can be removed or replaced very quickly. Rear end attachments of several kinds are also available. An 8-page descriptive folder is available. *Waterbury Tool Division of Vickers, Inc., Waterbury 91, Conn.*

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Triple Roll Crusher Plant

Three rolls, in this crusher, provide for a double pass and a greatly increased stage of reduction. The rolls are 40x22. A delivery conveyor delivers crushed material into trucks over the front end of the plant. Total weight is about 40,000 lbs. Full information from *Pioneer Engrg. Works, Minneapolis 13, Minn.*

Use coupon on page 67; write in No. 6-11

New Heavy-Duty Motor Grader

A heavy and powerful motor grader, the AD-4, by Allis-Chalmers, just announced, weighs 22,140 pounds, and has a 104-hp. diesel engine. Windrows up to about 30" high can be handled, and the moldboard design facilitates operation with heavy windrows. There are 6 speeds forward and three reverse. *Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wisc.*

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Allis-Chalmers AD-4 grader.

For Boring Under Walks, Walls, Roadways and Drives

A drill bit, a section of pipe, a water adaptor and a carpenter's bit brace are all you need to do these jobs, or to drill post holes. For horizontal boring, the drill bit will make a bore for a line up to 1½"; the reamer will make a bore for 2" pipe. Saves labor, reduces cost and speeds up the work. Electric power not required nor recommended. Write for folder. **Howell Utility Tool Co.**, 651 Bloomington Ave., Rialto, Calif.

Use coupon on page 67; write in No. 8-11

Tournapull for Small-Yardage Projects

The manufacturers say this 7-yd., self-loading, one-man operated, earth-mover is especially valuable for county,



The small tournapull.

government and city work. It is powered with a 100-hp. engine, will travel up to 25 mph., and turns in a 19-ft. radius. It is designed for light cut and fill work, road maintenance, working roadside gravel pits, hauling and spreading aggregate, building small dams and ponds, correcting erosion damage, and similar jobs. **R. G. LeTourneau, Inc.**, Peoria, Ill.

Use coupon on page 67; write in No. 9-11

Newest in Mowing Machines

This is a light weight (240-lb.) mower, which is adapted to use with the International, Ford, Leader and Gibson tractors. Both front-end and side models are available. The side mower blade follows the contour of the ground, to 45° up or down, and is well suited to roadside mowing. Full information from **Turner of Indiana Co.**, Indianapolis, Ind.

Use coupon on page 67; write in No. 10-11

A Bigger and More Powerful Loader

This is an addition to the Hough tractor-shovel line, and is the biggest yet announced. It has a bucket capacity of 1½ cu. yds., and a static loading capacity of 6,000 pounds. It has 4-wheel drive, a 76-hp. engine and large tires to insure off-the-road operation. Goes up to 16 mph; will not damage



Hough front end loader.

paved surfaces. Will dig, load trucks, spread, level, strip, skim, carry and bulldoze and plow and load snow. Full information from **Frank G. Hough Co.**, 802E Sunnyside Ave., Libertyville, Ill.

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Vestpocket Ditcher Cuts Narrow Trench

One of the smaller trench excavating machines is the Pony ditcher shown on page 64. It weighs about 6500 pounds, and is 4 ft. 4 ins. wide. It will cut to a depth of 4 ft. and to 6" and 8" widths. It is especially designed for water and sewage service line ditching, for gas pipes, and for pipe extensions, where a small, fast-working unit is de-

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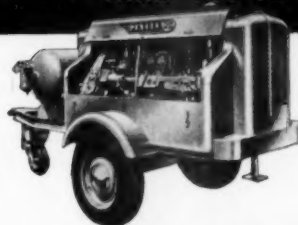


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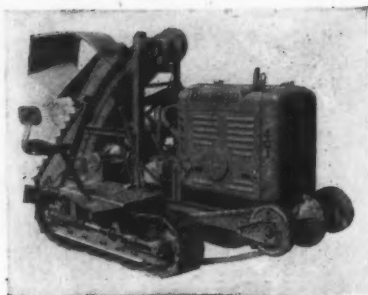
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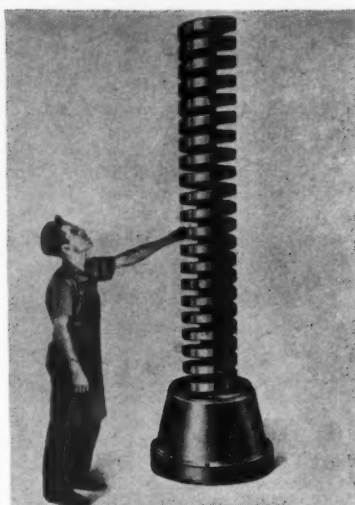
401 ditcher cuts 6" and 8" wide and 4' deep.

sirable. Digging speeds range from 2.19 miles an hour up. Spoil goes to both sides of the ditch. Also fine for laying cable and shallow conduits. Bulletin 401 describes this unit. *Findlay Division, Gar Wood Industries, Inc., Findlay, Ohio.*

Use coupon on page 67; write in No. 12-11

Vibratory Vertical Spiral Feeder

A spiral elevating ramp, to which is applied controlled vibration, provides a new way of elevating or lowering many types of bulk materials. Highspeed vibration causes the materials to flow up and around the ramp at rates controllable by a rheostat or reactor—no turning or rotating of the ramp is required. Opera-



Material handling ramp.

tion on 110, 220 or 440 volt AC. Diameter of the ramp is determined by the tonnage to be moved. *Syntron Co., 660 Lexington Ave., Homer City, Pa.*

Use coupon on page 67; write in No. 14-11

Sand & Gravel Pumps

Since it is impossible to prevent wear when handling gravel, sand and grit, these pumps are designed so as to make necessary replacements easy. Overhaul of the pump can be done by most any

workman. All wearing parts are of a special alloy. These pumps are built in 6", 8" and 10" to pass solids 4 1/4", 5 1/2" and 7 1/2". 4-page folder gives good engineering data. *Kansas City Hay Press Co., 801 Woodswether Road, Kansas City 6, Mo.*

Use coupon on page 67; write in No. 15-11

Turbine Pump for Small-Diameter Deep Wells

For small-diameter, deep wells, a new pump has been developed which will deliver up to 5,000 gph. from depths as great as 200 ft. This is an open line shaft pump, water lubricated; no oil is used underground. Complete description in Bulletin B-200. *Peerless Pump Division, Food Machinery and Chemical Corp., 301 West Ave. 26, Los Angeles 31, Calif.*

Use coupon on page 67; write in No. 16-11

Durable and Quick-Drying Traffic Paint

A new traffic paint is based on Pen-talyn 802A and Parlon, the former a synthetic resin and the latter a chlorinated rubber. Test lines laid on the second busiest intersection in the state of New Jersey showed little sign of wear in two months. Drying speed varies from 11 to 20 minutes, depending on the thickness of film and type of solvent. Full data from *Hercules Powder Co., Wilmington, Del.*

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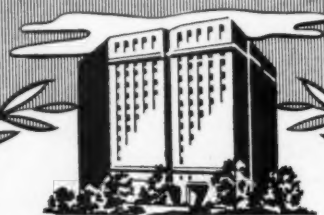
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BOOKLETS AND CATALOGS

Brief and to-the-point mentions:
All are available from the manufacturer or by using the coupon on page 67.

Highway Equipment. — Bituminous distributors, road brooms, steam tank car heaters, supply tanks and rear-end distributors are described in an excellent folder. Littleford Bros. Co., 452 East Pearl St., Cincinnati, O.

Construction Pumps. — A 12-page bulletin describing 17 different series of self-priming centrifugal pumps, with capacities from 50 to 4,000 gpm., and in sizes from 1½ to 10 ins. Mud-Hogs are also described. Marlow Pumps, 644 Greenwood Ave., Ridgewood, N. J.

Power Hoe. — This power hoe is a one bag plaster-mortar mixer which is trailed to the job and delivers up to 8 cu. ft. of material on some types of mixes; and this material is easier to spread because it is better mixed. Ask for Bulletin PM-8, Jaeger Machine Co., Columbus 16, Ohio.

Pavement Breakers. — Two folders are available showing numerous pavement breakers, including the Midget, one-man operated, which is run by a 105-cfm compressor and will break concrete pavement up to 9" thick. RPB Corporation, 2751 East 11th St., Los Angeles 23, Calif.

Bituminous Distributors. — This 8-page bulletin gives complete information on Kinney bituminous distributors which are made in capacities of 500 to 3000 gals. Kinney Mfg. Co., Boston 30, Mass.

Air Compressors: This catalog describes the new line of Jaeger air compressors, 75, 125, 185, 250, 365 and 600 cfm. Specifications; number of tools each compressor will operate; and other working data. 32 pp. Catalog JC-8. Jaeger Machine Co., Columbus 16, Ohio.

Jeffrey Mfg. Co., Columbus, O., a new catalog, No. 803, on spiral conveyors which is really a text book. It shows applications, tells how to specify and gives formulas for horsepower, etc. 48 pages.

Highway Research Board

The 28th annual meeting of the Highway Research Board will be held Dec. 7 through 10 at the National Research Council Building, 21st & Constitution Ave., Washington, D. C. For further information on this meeting, programs, information and hotel data write to the Board at the above address.

Southwest Section, AWWA

The Southwest Section of the American Water Works Association held its annual meeting in Galveston, Tex., Oct. 10 to 13. Registration was 545, the second largest in the history of the sec-

tion. The 1949 meeting will be held in Oklahoma City, Oct. 9 to 12. Morris B. Cunningham, Supt. and Engineer of the Oklahoma City Water Dept., was elected Director and Delbert W. Robinson, Water Works Engineer, Community Public Service Co., Fort Worth, was made Chairman.

Federation of Sewage Works Associations

The 21st annual Sewage Works meeting held in Detroit, Mich., Oct. 18 to 21, was one of the best and most successful that we know of. Attendance was excellent. V. M. Ehlers of

Texas, formerly vice-president, was elected president of the Federation, and A. H. Niles of Toledo is the new vice-president.

NEWWA

Arthur E. King, Superintendent of the Taunton, Mass., Water Department, has been nominated for president of the New England Water Works Association; Gordon M. Fair, dean of the Harvard Graduate School of Engineering, for vice-president; and F. O. A. Almquist, principal sanitary engineer of the Connecticut Department of Health, for director.

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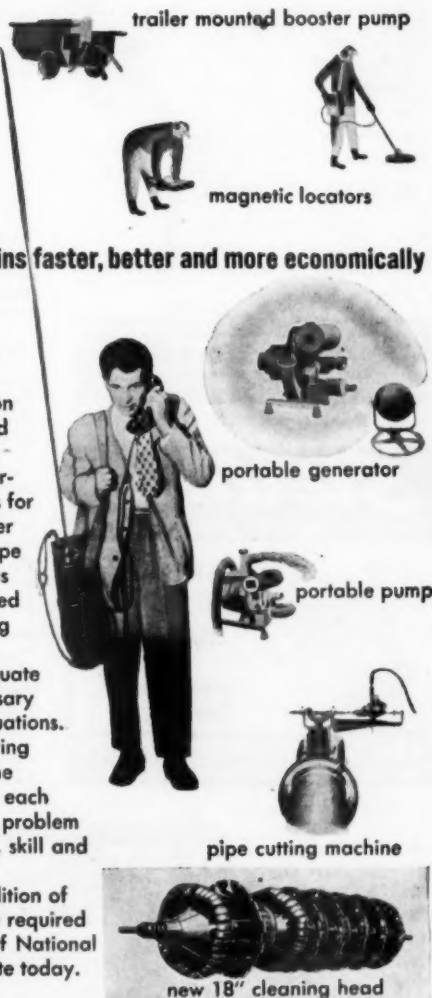
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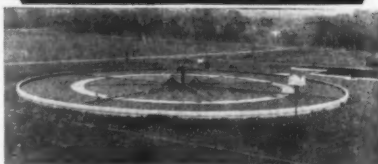
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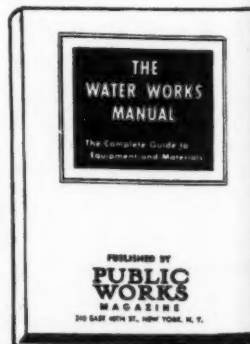
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107. Water main cleaning by the National Method is title of 4-page folder describing methods and results obtained, with full data. National Water Main Cleaning Co., 30 Church St., New York 7, N. Y.

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109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

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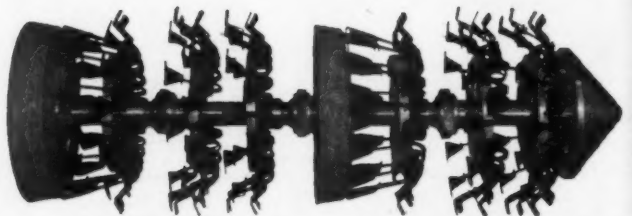
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13. Here, in a really beautiful booklet, is practically everything you need to know about this method of lining mains in place—the needs, methods, and results that will interest you. Centriline Corp., Dept. PW, 140 Cedar St., New York 6, N. Y.

Do Your Water Mains Need Cleaning?

38. Literature on Flexible method of cleaning water mains any size from 2" to 72", giving full details and list of nearest representatives in all parts of country. Address: Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles, Calif.

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59. For a copy of this compact folder on a hydraulic pipeline scraper which cleans all kinds of mains from 4 inches to 14 inches write to Dept. PW, Carver-Stimpson Pipe Cleaning Co., Walters, Okla.

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57. Leak Locators. Again available to waterworks superintendents, the Globe line of leak locators, dipping needles and pipe finders. Several leaflets describing the original Geophone leak locator, Little Wonder pipe phone, and the Magnetite Dipping Needle. Globe Phone Mfg. Corp., Dept. P., Reading, Mass.

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PERSONAL

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J. L. Johnson and Robert A. Stanley have been appointed to the technical sales staff of Vapor Recovery Systems Co. The former will work from the home office; the latter from the New York office.

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